

BUDDY-MOTIVATIONAL
INTERVIEWING (BUDDY-MI) TO
INCREASE PHYSICAL ACTIVITY IN
COMMUNITY SETTINGS: A
PRAGMATIC RANDOMISED
CONTROLLED TRIAL

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Table of Contents

1.1.1	Acknowledgments.....	xi
1.1.2	Abstract	1
1.1.3	Glossary.....	4
2	INTRODUCTION	9
2.1	Physical activity and health.....	9
2.2	Trends in physical activity promotion	17
3	BACKGROUND.....	23
3.1	The novel contribution of the study	23
3.2	Hypothesis	24
3.3	Rationale	25
3.4	The function of the buddy system.....	30
3.5	The role of Motivational Interviewing	31
3.6	Summary.....	32
4	LITERATURE REVIEW: PART ONE	33
4.1	A brief overview of relevant theory.....	33
4.2	Learning theory	34
4.3	Goal theory	35
4.4	Behaviour change theories and models	38
4.4.1	The Theory of Reasoned Action.....	43
4.4.2	The Theory of Planned Behaviour	43
4.4.3	Social Cognitive Theory	44
4.4.4	The Transtheoretical Model.....	46
4.4.5	The Health Belief Model	52
4.4.6	The Integrated Model.....	54
4.4.7	Social ecologic perspectives	55
4.4.8	Network phenomena	57
4.5	Individual versus group therapy.....	59
4.6	Self-Management theory.....	60
4.7	Cognitive dissonance	61
4.8	Motivational Interviewing.....	62
4.8.1	The Transtheoretical Model and Motivational Interviewing... 68	
4.8.2	Motivational Interviewing summary and conclusions.....	70
4.9	Overall conclusions	71
4.10	LITERATURE REVIEW: PART TWO.....	73
4.10.1	Introduction: an integrative systematic review of social support interventions	73
4.10.2	Systematic review methods.....	79
4.10.3	Appraisal of included studies	86
4.10.4	Literature review results.....	90
4.10.5	Population.....	91
4.11	Systematic reviews: introduction.....	93
4.12	Systematic reviews: results	94
4.13	Systematic reviews: summary.....	109
4.14	Systematic reviews: conclusions	111

4.15	Original primary studies: introduction	113
4.16	Results summary	139
4.16.1	Body of evidence	139
4.16.2	Summary of key findings.....	143
4.16.3	Limitations in primary research methodology	149
4.16.4	Contextual limitations and implications.....	150
4.17	Concluding comments	151
5	METHODS.....	153
5.1	Overview	153
5.1.1	Primary objective.....	153
5.1.2	Specific study aims	154
5.1.3	Study design/overview	155
5.2	Research questions.....	160
5.2.1	Self-report physical activity.....	160
5.2.2	Cardio-respiratory fitness	160
5.2.3	Self-reported quality of life	161
5.2.4	Self-efficacy	161
5.2.5	Exercise stages of change	161
5.2.6	Social support.....	162
5.2.7	Treatment satisfaction.....	162
5.3	Outcomes: overview	162
5.3.1	Primary outcomes	162
5.3.2	Secondary outcomes	163
5.3.3	Demographics & bio-measures	163
5.4	Study hypothesis	163
5.5	The host institution.....	164
5.5.1	Enrolled participants	164
5.5.2	Non-enrolled motivational-buddies.....	166
5.6	Recruitment	166
5.7	Experimental intervention background and rationale	167
5.8	Pilot testing and refinement of the intervention	170
5.8.1	Therapist training.....	171
5.8.2	Treatment fidelity	172
5.8.3	Development of the buddy-role.....	174
5.8.4	Developing the training resources	181
5.8.5	Developing therapeutic strategies	186
5.9	Randomised trial	189
5.9.1	Intervention delivery specifics	189
5.9.2	Setting	191
5.9.3	Optional activities and components	191
5.9.4	The active control intervention.....	192
5.9.5	Therapist skill development/Clinical supervision.....	193
5.9.6	Fidelity monitoring	195
5.9.7	Administration and follow-up	196
5.10	Outcome measures/instruments	197
5.10.1	Rationale.....	197

5.11	Primary outcomes.....	199
5.12	Secondary outcomes.....	204
5.12.2	Exercise stage of change (readiness)	205
5.12.3	Participant's experience with the programme and motivational-buddy attributes: qualitative and quantitative findings.....	207
5.12.4	Buddy empathy.....	208
5.12.5	Ethics	211
5.13	Analysis	218
5.13.1	Introduction	218
5.13.2	Collating and processing the data	219
5.13.3	Statistical methods.....	219
5.13.4	Effect size	224
5.14	Analysis overview: therapeutic effectiveness	225
5.14.2	Secondary outcome variables	227
5.14.3	Qualitative data overview	229
5.15	Summary.....	229
6	RESULTS	231
6.1	Introduction	231
6.2	Descriptive Statistics: socio-demographic and clinical profiles ..	232
6.2.1	Gender	233
6.2.2	Ethnicity	234
6.2.3	Age	234
6.2.4	Physical limitations	235
6.2.5	Smoking status	236
6.2.6	Body-Mass and BMI.....	236
6.2.7	Statistical modelling: example FITNESS	239
6.2.8	Statistical method: mixed-effects modelling.....	240
6.2.9	Model diagnostics	242
6.2.10	Regression coefficients and p-values.....	247
6.2.11	Point estimates and confidence intervals	248
6.2.12	Calculating p-values for Control vs. Treatment	251
6.2.13	Graphs of the estimates with 95% CIs (e.g. FITNESS).....	251
6.2.14	Effect size: (e.g. FITNESS)	253
6.2.15	Physical activity	255
6.2.16	Body Mass Index: BMI.....	264
6.2.17	Health-related quality of life: PCS & MCS	266
6.2.18	Generalised self-efficacy: SelfE	269
6.2.19	Exercise self-efficacy: ExSelfE	271
6.2.20	Effect size summary	273
6.2.21	Exercise stage of change: TTM	275
6.2.22	Treatment fidelity	279
6.2.23	Helpful responses questionnaire	280
6.3	Qualitative results: exit survey.....	282
6.3.1	Exit survey free-text and multi-choice responses	282
6.3.2	Multi-choice responses	285
7	DISCUSSION.....	289

7.1	Preamble	289
7.1.1	Brief review of the health problem	291
7.1.2	Hypothesis.....	291
7.1.3	Brief summary of methods	293
7.1.4	Sample characteristics	294
7.2	Discussion of the main findings	303
7.2.1	The behavioural/physical group of outcomes	303
7.2.2	Interim summary: physical/behavioural outcomes	311
7.2.3	The psychological group of outcomes	313
7.2.4	The theory group of outcomes.....	321
7.2.5	Treatment fidelity: introduction	329
7.2.6	Fidelity strategies	330
7.2.7	Treatment fidelity: conclusions	336
7.2.8	Buddy characteristics and outcomes	337
7.2.9	Buddies' involvement: time, strategies and style	339
7.2.10	Buddies' investment of time.....	340
7.2.11	Motivational strategies	341
7.2.12	Buddy attributes and style.....	342
7.2.13	Scope for improving buddy performance.....	344
7.2.14	Buddy training.....	345
7.2.15	Interim summary: training	349
7.2.16	Buddy selection	349
7.2.17	Buddy volunteering: a subjective cost-benefit analysis?	354
7.2.18	Interim summary: buddy selection	361
7.2.19	Strengths of the research methodology	363
7.2.20	Limitations of the research methodology	368
7.2.21	Recommendations for further research	375
7.2.22	Implications for practice	377
7.2.23	Implications for health promotion policy in general.....	381
7.2.24	Implications for physical activity programmes specifically	382
7.2.25	Conclusions: key messages from the research	384
7.2.26	Social norms: barriers to change?.....	385
8	REFERENCES	391
9	Appendix A.....	413
9.1	The Physical Activity Readiness Questionnaire	415
9.2	Cooper 12min fitness test	416
9.3	Helpful Response Questionnaire	420
10	Appendix B.....	423
10.1	Ethics approval UC	425
10.2	Ethics approval CPIT	426
10.3	Confidentiality agreement: research assistant	427
11	Appendix C	429
11.1	Recruitment letter/email.....	431
11.2	Recruitment flyer	432
11.3	Participant Information Sheet	433
11.4	Motivational-buddy Information Sheet	435

11.5	Consent form: Participant	437
11.6	Consent form: Buddy	439
11.7	Buddy basics instructional booklet	441
11.8	Buddy-basics DVD cover art	451
11.10	Training guidelines for interventionists.....	453
12	Appendix D.....	473
12.1	Model diagnostic plots and R output	475
12.2	R statistical packages and descriptions	480
12.3	Qualitative exit-survey responses	482
13	Appendix E.....	491
13.1	Data extraction tables: Reviews.....	493
13.2	Data extraction tables: Primary research studies.....	506
13.3	Search strategy.....	536
14	Appendix F	539
14.1	Original publication.....	540

List of Figures

Figure 1:	Schematic representation of the dose-response relationship between physical activity level and risk of disease	11
Figure 2:	Commonly described constructs in health behaviour change theories and models	41
Figure 3:	Theory of Planned Behaviour.....	43
Figure 4:	Major sources of efficacy information and the principal sources through which different modes of treatment operate	44
Figure 5:	The TTM or 'Stages of Change' model.....	47
Figure 6:	The Health Belief Model	52
Figure 7:	The Integrated Model.....	54
Figure 8:	Concepts of Motivational Interviewing.....	64
Figure 9:	Flow of identified studies through the eligibility and appraisal process.....	89
Figure 10:	Study flowchart	158
Figure 11:	Study flowchart (<i>continued</i>)	159
Figure 12:	Schematic of the basic concept draft or starting point for the development of the buddy-MI intervention.....	169
Figure 13:	The final schematic for the buddy-MI intervention, representing the <i>in-session</i> interactions only	180
Figure 14:	Examples of measurement methods and points of measurement related to physical activity, cardio-respiratory fitness and health outcomes.	198
Figure 15:	The Whare-Tapa-Wha model	217
Figure 16:	The distribution of gender by group for the 60 study participants.....	233
Figure 17:	The age distribution of the sample (n=60)	235
Figure 18:	Participants' BMI at baseline (n=60).....	237

Figure 19: Diagnostic plots for the outcome variable FITNESS: normality of residuals and the estimated random effects.....	244
Figure 20: R output of the model comparison statistics for anova (m1,m2) ..	245
Figure 21: R summary output and interpretation for the outcome FITNESS	246
Figure 22: R output for the y-variable FITNESS with regression coefficients and MCMC <i>p</i> -values	248
Figure 23: R output for the control group, estimates and 95% CIs.....	250
Figure 24: R output for the experimental group, estimates and 95% CIs	251
Figure 25: R output for the variable FITNESS with <i>p</i> -values for differences between the control vs. experimental groups	251
Figure 26: Estimated average fitness level and 95% confidence intervals (FITNESS).....	252
Figure 27: R summary output for the outcome FITNESS (Group 1)	253
Figure 28: Estimated average minutes of leisure time physical activity per day and 95% confidence intervals (TMODeqv)	257
Figure 29: Estimated average total physical activity per day measured as MET-min/day and 95% confidence intervals (TPAmet)	259
Figure 30: Estimated average total time spent sitting inactive per day and 95% confidence intervals (SDHav)	262
Figure 31: Estimated average body mass index and 95% confidence intervals (BMI)	264
Figure 32: Estimated average physical health component score and 95% confidence intervals (PCS).....	266
Figure 33: Estimated average mental health component score and 95% Confidence Intervals (MCS)	268
Figure 34: Estimated average self-efficacy score and 95% confidence intervals (SelfE).....	270
Figure 35: Estimated average exercise self-efficacy and 95% confidence intervals (ExSelfE)	272
Figure 36: Participants' stage progression over 12-months	276
Figure 37: The individual participant's (n = 56) progression of stages between baseline and 12-month follow-up– ordered by group by end-stage by baseline-stage.....	278
Figure 38: Average number of email exchanges and treatment sessions per group	279
Figure 39: Treatment fidelity scores via the MITI 3.1.1	280
Figure 40: Averaged HRQ scores by gender	281
Figure 41: Histogram of all the participant responses describing their buddy's motivational strategies	286
Figure 42: Histogram of participant responses describing their buddy's motivational style	287
Figure 43: Time in a typical week that motivational-buddies provided input	287
Figure 44: Overview of the behavioural and physical outcomes by group ...	306
Figure 45: Different support styles.....	350
Figure 46: Biological vs. statistical normality	387
Figure 47 Typical 400m track layout	417

List of Tables

Table 1: A brief summary of the broad theoretical contributions to the novel intervention	33
Table 2: Similar or identical constructs within five common health behaviour models.....	42
Table 3: Summary of MI terminology and definitions	67
Table 4: PICO Criteria for determining study eligibility	81
Table 5: NHMRC additional levels of evidence and grades for intervention studies	82
Table 6: Nature of the evidence.....	83
Table 7: Exclusion criteria.....	85
Table 8: Systematic review results for the effectiveness of behaviour change interventions involving social support	94
Table 9: Summary characteristics of the included primary research studies .	114
Table 10: Body of evidence– effectiveness of interventions	141
Table 11: Pilot study fidelity scores via the MITI 3.1.1 instrument and competency thresholds, n = 16 participants.....	174
Table 12: Desirable motivational-buddy characteristics and skills, their theoretical basis and examples of relevant literature.....	185
Table 13: The most commonly used therapeutic strategies ranked approximately by usage.....	189
Table 14: Main study first quarter fidelity scores via the MITI 3.1.1 instrument and reference competency thresholds, n = 8 participants	196
Table 15: Outcome measure summary table	210
Table 16: Participants' baseline characteristics	238
Table 17: Estimated average fitness level	252
Table 18: Estimated average minutes of leisure time physical activity per day.....	257
Table 19: Estimated average total physical activity per day (Met-min/day) .	260
Table 20: Estimated average total time spent sitting inactive per day	262
Table 21: Estimated average body mass (Kg).....	265
Table 22: Estimated average body mass index (BMI).....	265
Table 23: Estimated average physical health component score	267
Table 24: Estimated average mental health component score.....	268
Table 25: Estimated average self-efficacy score.....	270
Table 26: Estimated average exercise self-efficacy	272
Table 27: Summary of within and between group effect sizes.....	274
Table 28: A guide to interpreting Cohen's <i>d</i>	275
Table 29: The distribution of participants over the four time points.....	277
Table 30: Sentence synthesis to structure the study findings for the theme 'ripple effect'.....	283

Table 31: Sentence synthesis to structure the study findings for the theme 'accountability'	284
Table 32: Sentence synthesis to structure the study findings for the theme 'general programme acceptability'	285
Table 33: Sentence synthesis to structure the study findings for the theme 'buddy matching'	285
Table 34: Summary of behavioural/physical changes over time compared to baseline	307
Table 35: Comparing 'adopting' vs. 'cessation' behaviours by buddy- relationship types.....	353
Table 36 Normative data for VO2max, Female (values in ml/kg/min)	417
Table 37 Normative data for VO2max, Male (values in ml/kg/min).....	417
Table 38 Normative data for VO2max, Male (values in ml/kg/min).....	417
Table 39: Exit survey questions	418
Table 40: Helpful Responses Questionnaire scoring guide.....	421

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1.1.2 Abstract

Populations in developed and developing countries are becoming increasingly sedentary and the adverse health effects of relatively sedentary lifestyles, the so called lifestyle diseases, are now obvious. However, moderately vigorous physical activity is positively linked via a cause-and-effect relationship with a range of improved health outcomes. Broadly, current physical activity recommendations suggest that adults should achieve a total of at least 30 minutes a day of at least moderate intensity physical activity on five or more days of the week; however, estimates suggest that the majority of adults in the Western World do not meet these recommendations. Many of the factors involved in the initiation and long-term maintenance of physical activity are not fully understood. Considering the rapid pace of technological development and the general move away from labour-based economies, it does appear that the required level of physical activity necessary for optimal health needs to come from leisure-time activity– specifically, planned, regular, moderately vigorous exercise and/or sport. Unfortunately, many people experience great difficulty in engaging with and maintaining a physically active lifestyle and typically there is a rather large gap between what people know to be healthy and what they actually do.

The general aim of this project was to design, implement and evaluate the clinical, social and behavioural effectiveness of a buddy-Motivational Interviewing intervention (buddy-MI) in assisting relatively sedentary adults

to adopt and maintain regular physical activity for the purpose of improving their cardio-respiratory fitness, health, and quality of life. Specific aims of the intervention included formally involving social support (via the self-selected motivational-buddy) and strengthening individuals' motivation for and movement toward their physical activity goals. The experimental intervention specifically aimed to extend the MI treatment effect by enhancing participants' commitment to physical activity over time via intra-treatment social support (support provided within treatment sessions) as well as extra-treatment social support (day-to-day support) provided by the motivational-buddy. A fundamental was to deliver the intervention in a format that could realistically be implemented within typical primary care settings, workplaces, schools or other similar setting: to work towards healthier more active communities and to potentially reduce health system resource utilisation.

Using a repeated-measures pragmatic parallel group randomised controlled trial (RCT) design, relatively sedentary adolescents and adults, in stable health, recruited from a university campus population were allocated to one of two interventions. In the experimental intervention, participants were supported by a self-selected motivational-buddy and they received 2-4 sessions of buddy-MI over a period of 12-months (participant determined schedule) as well as pro-active follow-up emails. The control intervention was standard care MI, and the same email follow-up as in the experimental group but *without* the additional support of a motivational-buddy. The main

outcomes were self-reported physical activity, cardio-respiratory fitness and health related quality of life. These primary outcomes were measured at four time-points over the 12-months intervention and follow-up period and quantitative methods were used to analyse the data. Qualitative data were also analysed and presented in relation to the motivational-buddy component of the intervention.

The study evaluated the feasibility and incremental effectiveness of motivational-buddy support compared to one-on-one MI in people who had expressed an interest in becoming more physically active. It used a novel intervention design incorporating self-selected motivational-buddies in an effort to mitigate the twin problems of poor adherence and behavioural regression that are commonly associated with physical activity promotion programmes. The intervention was found to have merit and the potential implications for the health-care system, and the wider community, are discussed.

1.1.3 Glossary

Adjustment: a statistical technique to eliminate the influence of one or more confounders on the treatment effect. For example, adjustment for age involves a computational procedure to mimic a situation in which the men and women in the data set were of the same age. This computation eliminates the influence of age on the treatment effect.

Age standardisation: A procedure for adjusting rates designed to minimise the effects of differences in age composition when comparing rates for different populations.

Analysis of variance (ANOVA): A statistical analysis involving the comparison of variance reflecting different sources of variability.

A priori: Not based on prior study or examination.

Before and after study: A situation in which the investigator compares outcomes before and after the introduction of a new intervention.

Bias: Deviation of results or inferences from the truth, or processes leading to such deviation. Any trend in the collection, analysis, interpretation, publication, or review of data that can lead to conclusions that are systematically different from the truth.

Blinded study: A study in which observers and/or subjects are kept ignorant of the group to which they are assigned. When both observers and subjects are kept ignorant, the study is referred to as double blind.

Cohen classification: A system that categorises the pooled effect size into small, medium and large categories. A small effect accounts for $\leq 1\%$ of the variance of the population, a medium effect accounts for 1% to $\leq 5.9\%$ of the population variance, and a large effect accounts for between 5.9% and 13.8% of the variance.

Confidence interval: The computed interval with a given probability, e.g. 95%, that the true value of a variable such as a mean, proportion, or rate is contained within the interval. The 95% CI is the range of values in which it is 95% certain that the true value lies for the whole population.

Confounder: A third variable that indirectly distorts the relationship between two other variables, because it is independently associated with each of the variables.

Confounding: A situation in which the measure of the effect of an exposure on risk is distorted because of the association of exposure with other factor(s) that influence the outcome under study.

Cost benefit analysis: An economic analysis in which the costs of medical care and the benefits of reduced loss of net earnings due to preventing premature death or disability are considered.

Cost effectiveness (CE): Involves the relationship between costs and effects, providing information on whether a technology is being delivered to those who would benefit from it with an optimal use of resources. It is expressed as a ratio of the effects (number of lives saved, number of disability days avoided) obtained for a specific cost (expressed in dollars).

Cross-sectional study: A study that examines the relationship between diseases (or other health related characteristics), and other variables of interest as they exist in a defined population at one particular time.

Descriptive study: A study concerned with, and designed only to describe the existing distribution of variables, without regard to causal or other hypotheses.

Effectiveness: A measure of the extent to which a specific intervention, procedure, regimen, or service, when deployed in the field in routine circumstances, does what it is intended to do for a specified population.

Efficiency: The effects or end results achieved in relation to the effort expended in terms of money, resources and time. The extent to which the resources used to provide a specific intervention, procedure, regimen, or service of known efficacy and effectiveness are minimised.

Generalisability: Applicability of the results to other populations.

Grey literature: That which is produced by all levels of government, academics, business and industry, in print and electronic formats, but which is not controlled by commercial publishers.

High risk groups: Usually refers to groups of people who have been identified as having a higher than expected, or higher than average for the population as a whole, incidence of the disease in question.

Incidence: The number of new events (cases; e.g. of disease) occurring during a certain period, in a specified population.

Intention to treat: A method for data analysis in a randomised controlled trial in which individual outcomes are analysed according to the group to

which they were randomised, even if they never received the treatment to which they were assigned.

Intention to treat analysis: A method for data analysis in a randomised controlled trial in which individual outcomes are analysed according to the group to which they were randomised, even if they never received the treatment to which they were assigned.

Matching: The process of making a study group and a comparison group comparable with respect to extraneous factors.

MCMC: a class of algorithms for sampling from probability distributions based on constructing a Markov chain that has the desired distribution as its equilibrium distribution.

Mean: Calculated by adding all the individual values in the group and dividing by the number of values in the group.

Median: Any value that divides the probability distribution of a random variable in half. For a finite population or sample the median is the middle value of an odd number of values (arranged in ascending order) or any value between the two middle values of an even number of values.

Meta-analysis: The process of using statistical methods to combine the results of different studies. The systematic and organised evaluation of a problem, using information from a number of independent studies of the problem.

Morbidity: Illness.

Mortality: The number of deaths from a specified disease which are diagnosed or reported during a defined period of time in a given population.

Multiple: regression: Any analysis of data that takes into account a number of variables simultaneously.

Odds ratio (OR): A measure of the degree or strength of an association. In a case control or a cross sectional study, it is measured as the ratio of the odds of exposure (or disease) among the cases to that among the controls.

Power: The ability of a study to demonstrate an association if one exists.

Prevalence: The number of events in a given population at a designated time (point prevalence) or during a specified period (period prevalence).

Primary care: First contact, continuous, comprehensive and coordinated care provided to individuals and populations undifferentiated by age, gender, disease or organ system.

Providers: Organisations and health professionals providing health services.

Random sample: A sample that is arrived at by selecting sample units such that each possible unit has a fixed and determinate probability of selection.

Randomised controlled trial: An epidemiologic experiment in which subjects in a population are randomly allocated into groups to receive or not receive an experimental, preventive or therapeutic procedure, manoeuvre, or intervention. Randomised controlled trials are generally regarded as the most scientifically rigorous method of hypothesis testing available in epidemiology.

Recall bias: Systematic bias due to differences in accuracy or completeness of recall or memory of past events or experiences.

Reference standard: An independently applied test that is compared to a screening or diagnostic test being evaluated in order to verify the latter's accuracy. A reference standard, therefore, provides an accurate or "truth" diagnosis for verification of positive and negative diagnoses. It is sometimes described as providing "final truth determination".

Risk factor: An exposure or aspect of personal behaviour or lifestyle, which on the basis of epidemiologic evidence is associated with a health-related condition.

Selection bias: Error due to systematic differences in characteristics between those who are selected for inclusion in a study and those who are not (or between those compared within a study and those who are not).

Sensitivity analysis: A method to determine the robustness of an assessment by examining the extent to which results are affected by changes in methods, values of variables, or assumptions.

Systematic review: Literature review reporting a systematic method to search for, identify and appraise a number of independent studies.

Thentest study design: extends the standard pretest–posttest design by re-administering questionnaire(s) at the time of follow-up, most times immediately after completion of the posttest.

Variance: A measure of the variation shown by a set of observations, defined by the sum of the squares of deviation from the mean, divided by the number of degrees of freedom in the set of observations.

2 INTRODUCTION

2.1 *Physical activity and health*

Physical inactivity¹ is a serious and increasing public health problem. Low levels of physical activity have become a major public health problem in most western societies (World Health Organization, 2002, 2004). The evidence shows that the health impact of inactivity in terms of coronary heart disease, for example, is comparable to that of smoking, and almost as great as high cholesterol levels (McPherson, Britton, & Causer, 2002). The evidence is now clear that moderately vigorous or vigorous physical activity is linked via a cause-and-effect relationship with a range of positive health outcomes and regular physical activity can have a beneficial effect on up to 20 chronic diseases or disorders including protecting against coronary heart disease, stroke, hypertension, obesity, Type 2 diabetes and some cancers, and regular physical activity may also enhance mood and functional capacity (Booth, Chakravarthy, Gordon, & Spangenburg, 2002). The risks associated with taking part in physical activity at levels that promote health are low (Department of Health Physical Activity Health Improvement and Prevention, 2004). It is only recently in human evolution that energy

¹ Broadly, the term physical inactivity is synonymous with the term sedentary and both are commonly used to denote a type of lifestyle with no or irregular physical activity. Taken literally, physical inactivity could mean the absence of any body movement over and above the resting state. However, the term physical inactivity is usually applied in a relative sense, that is, with some reference to a standard, recommendation or categorisation. In all cases, such categories are arbitrary but the intent is usually to differentiate between levels of physical activity that are sufficient to enable health benefits and levels that are not. For example, the 2006/07 New Zealand Health survey (Ministry of Health, 2008) defined physically active as – at least 30 minutes of physical activity per day on five or more days of the last week, and sedentary as – less than 30 minutes of physical activity in the last week. In this study, physical inactivity is defined as daily energy expenditure $\leq 35\text{kcal/kg/day}$.

expenditure (primarily searching for sustenance) has not been inextricably linked to energy intake. Since the Industrial Revolution and more recently the emergence of technological advances, a serious mismatch has emerged between food availability and the energy required to access it (Gluckman & Hanson, 2006).

Investigators have now measured the benefits associated with physical activity objectively, using quantitative methods. From the 1920s, cross-sectional studies of occupational activity levels and cardiovascular disease began to demonstrate that a gradient of increasingly physically demanding jobs was inversely related to all-cause mortality. These cross-sectional studies, however, were unable to establish causality due to their inherent inability to adequately control for confounding variables (Paffenbarger, Blair, & Lee, 2001). However, in a series of ground-breaking prospective cohort studies, Jeremy Morris and his colleagues (Morris, Heady, Raffle, Roberts, & Parks, 1953; Morris, Kagan, Pattison, & Gardner, 1966; Paffenbarger & Hale, 1975; Paffenbarger, Wing, & Hyde, 1978) went on to demonstrate the so called ‘independent protective effect’ of moderately vigorous or vigorous exercise.

Morris and colleagues’ (1966) elegant study of the relative incidence of acute myocardial infarction in London’s double-decker busmen 1949-1958 showed that the more physically active bus conductors were “relatively immune” from coronary heart disease as compared to the more sedentary

drivers. These early studies of occupational physical activity and later studies of leisure-time activity (Morris, et al., 1973; Paffenbarger, Blair, Lee, & Hyde, 1993;

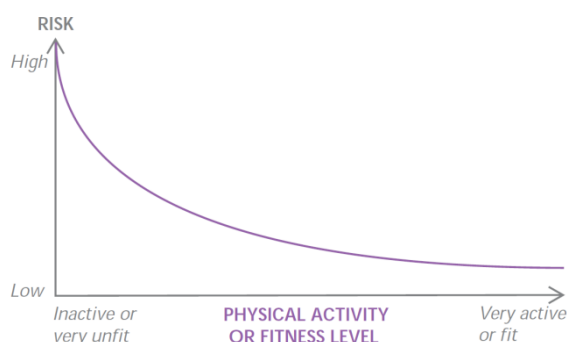


Figure 1: Schematic representation of the dose-response relationship between physical activity level and risk of disease

Adapted from (Lee and Skerrett, 2001)

Paffenbarger, et al., 1978) clearly established that physical inactivity is a major independent risk factor for coronary heart disease. More recently, Lee and Skerrett (2001) analysed data from 44 studies and described a ‘curvilinear dose-response curve’ (**Figure 1**) showing the relationship between physical activity levels and all-cause mortality. The curve illustrates that greater benefits occur with greater activity participation, with ‘diminishing returns’ at the higher levels. From a public health perspective, helping people to move from an inactive level to low or to moderately active levels will produce the greatest reduction in risk.

From the 1950s onwards, researchers went on to establish high correlations between aerobic exercise (sustained sub-maximal exercise), cardiovascular fitness² and specific physiological adaptations (see for example: Astrand, 1960; Carter, et al., 2000; Costill, Thomason, & Roberts, 1972; Londeree & Moeschberger, 1997; Noakes, 1998). Wilmore et al. (1970) for example,

²The efficiency of the heart, lungs, and vascular system in delivering oxygen to the working muscle tissues so that prolonged physical work can be maintained.

established that ‘jogging’ could be used to promote significant decreases in both systolic and diastolic blood pressures, resting heart-rate and relative heart-rate (at a given exercise intensity) and also significant increases in cardiorespiratory fitness, as measured by increases in maximum oxygen uptake³. Maximum oxygen uptake ($\text{VO}_{2\text{max}}$) (Hill & Lupton, 1923) can be defined simply as an individual’s maximum rate of oxygen consumption (and indirectly, the rate of releasing energy for all bodily functions) (Foss, Keteyian, & Fox, 1998; Sleivert, 2000). Despite some debate as to the underlying mechanisms⁴, there is now a great volume of empirical evidence that demonstrates the link between cardiovascular fitness ($\text{VO}_{2\text{max}}$) and a wide array of health outcomes. Inactive and unfit people have almost double the risk of dying from coronary heart disease compared with more active and fit people (Kohl et al. 1992). Kohl et al. (1992) investigated the association between baseline cardio-respiratory fitness and all-cause mortality, and when controlling for the risk factors of age, resting systolic blood pressure, serum cholesterol, body mass index, family history of heart

³Maximum oxygen uptake ($\text{VO}_{2\text{max}}$) is one measure of an individual’s potential to perform endurance type exercise. The term was coined by Hill and Lupton (1923) who proposed that there is an upper limit to oxygen uptake, that there is variance between different individuals’ $\text{VO}_{2\text{max}}$, and that $\text{VO}_{2\text{max}}$ is limited by the ability of the cardiorespiratory system to transport Oxygen (O_2) to the muscles.

⁴Much debate has occurred around the factors that limit $\text{VO}_{2\text{max}}$, the so called central limiting factors (the supply of O_2 by the cardiovascular system) and the peripheral limiting factors (the utilisation of O_2 within the muscle) (see Noakes, (1998) and Carter et al. (2000) as examples of the contrasting perspectives). $\text{VO}_{2\text{max}}$ is largely determined by genetic factors, and does not usually change appreciably over the course of the year if an individual’s physical activity level is relatively constant. However, $\text{VO}_{2\text{max}}$ can be improved to some extent provided enough time is given and exercise is prescribed and performed correctly. $\text{VO}_{2\text{max}}$ may be expressed either in absolute terms (litres per minute [l/min]) or in relation to body weight (millilitres per minute per kilogram of weight per minute [ml/kg/min]). The unit ml/kg/min is preferred for sports in which weight is repeatedly lifted such as running and walking (in weight supported activities like rowing the units L/min are considered more relevant) (Sleivert, 2000).

disease, follow-up interval and smoking habit, the data showed a significantly higher risk of premature death (RR = 1.92; 95% CI 0.75-4.90) due to all causes for unfit compared with fit men. Thus, physical inactivity and low fitness can be considered (almost synonymously for some purposes) as major and equally important risk factors for a wide range of chronic diseases. In discussing 'fitness' and 'physical activity' in a health-benefit context— physical activity is seen as the behaviour targeted for change, as fitness can only be modified by changing physical activity behaviour.

Since the 1900s, labour-saving devices have been invented to transport us and do our work. Computers and related technologies have resulted in many jobs requiring little or no physical input. Generally, populations in developing/developed countries are becoming increasingly sedentary and the adverse health effects of physical inactivity, the so called 'lifestyle' diseases, are now obvious (Paffenbarger, et al., 2001; World Health Organization, 2002). Indications are that in recent years, increasing trends in life expectancy in New Zealand are not paralleled by improvements in morbidity; due largely to the progression of non-communicable diseases, particularly coronary heart disease, obesity and Type 2 diabetes (Ministry of Health, 2001; Ministry of Health., 2005). Morris and colleagues' early comparative studies in occupational settings (Morris, et al., 1953; Morris, et al., 1966) led Morris to declare that the levels of physical activity necessary to counter an increasingly inactive society would have to come from

‘leisure-time’ activity– specifically, planned, regular, moderately vigorous, sustained rhythmic exercise and sport involving large muscle groups in the body (Morris, 1994; Morris, Clayton, Everitt, Semmence, & Burgess, 1990).

Current physical activity recommendations state that for general health benefits, adults should achieve a total of at least 30 minutes a day of at least moderate intensity physical activity on 5 or more days of the week (a total of 150 minutes/week). This recommendation was originally formulated by a review of evidence and expert consensus in 1994 and published in the recommendations produced by the American College of Sports Medicine and the Centers for Disease Control (Pate, et al., 1995) and later endorsed by the USA Surgeon General (USA Department of Health and Human Services, 1996). These recommendations are now generally accepted worldwide (Department of Health Physical Activity Health Improvement and Prevention, 2004; New Zealand Ministry of Health, 2003; World Health Organization, 2004). The recommended levels of activity can be achieved either by doing all the daily activity in one session, or through several shorter bouts of activity of 10 minutes or more. The activity can be lifestyle activity⁵ or structured exercise or sport, or a combination of these. Higher and more specific activity levels might be required for the optimal management of some diseases and conditions. Activity each day may be

⁵All movement contributes to energy expenditure and lifestyle activity means activities that are performed as part of everyday life, such as climbing stairs or brisk walking.

needed for some people, in the order of 45-90 minutes/day of moderate-vigorous activity and/or the inclusion of strength based exercises. To put these recommendations in context, a physical activity energy expenditure of 500-1,000kcal per week or about 10-20 kilometres of walking for an average-weight individual reduces the risk of premature death by 20-30% (Lee & Skerrett, 2001).

According to New Zealand health survey data from over 17,000 New Zealanders for the period 2006-2007, approximately half of all adults reported that they regularly engaged in at least 30 minutes of physical activity a day on five or more days in the previous week (Ministry of Health, 2008b). However, one in seven adults (15.0%) reported less than 30 minutes of physical activity total per week (sedentary). From 2002/03 to 2006/07 there was an increase in sedentary behaviour (worsening) for both men and women. Time trends in regular physical activity for adults suggest that between 2002/03 and 2006/07, regular physical activity (adjusted for age) declined (the difference did not reach statistical significance) and for the same period, there was an increase in sedentary behaviour for both men and women and the increase was significant for women ($p < .05$) (Ministry of Health, 2008b). Much lower physical activity levels were reported in three earlier 'Push Play' serial evaluation surveys conducted annually between 1999-2002 (Bauman, et al., 2003). Bauman, et al. (2003) analysed sample data (effective sample sizes of 665, 506, 504 and 507 New Zealand adults in each year) and reported 38.6% of the 1999 sample reporting 5+

days activity per week, increasing to 44.5% in 2000, but declining to 38.0% in 2002. In England, research has highlighted that only 30% of the adult population was undertaking sufficient physical activity to benefit their health. In the Health Survey for England 1998 (Department of Health, 2000; Office for National Statistics, 2004), about two thirds of men and three-quarters of women reported less than 30 minutes of moderate intensity physical activity a day on five or more days of the week and about a third of men and between a third and a half of women reported less than 30 minutes of activity per week (i.e., are inactive or sedentary). In the US, only 31 percent of U.S. adults report that they engage in regular leisure-time physical activity (defined as either three sessions per week of vigorous physical activity lasting 20 minutes or more, or five sessions per week of light-to-moderate physical activity lasting 30 minutes or more). About 40 per cent of US adults report no leisure-time physical activity at all (National Center for Health Statistics, 2008).

Recent research suggests that actual physical activity levels could be even lower than that typically self-reported in population surveys. In contrast to self-reported physical activity levels in a representative US adult population sample, Troiano, et al. (2008) found that when physical activity was measured directly by an accelerometer device that detects movement (including 25,797 person/days of data), only about 3-5% of participants obtained 30 minutes of moderate or greater intensity physical activity on at least five days per week. Troiano, et al. (2008) cautioned that great care

must be taken when interpreting self-reported physical activity data as adherence to physical activity recommendations according to accelerometer-measured activity is substantially lower than self-report.

Given the strength of the relationships between inactivity and individual diseases, the broad range of diseases benefited, and the pervasive nature of inactive lifestyles, there are likely to be few public health initiatives that have greater potential for improving health and well-being than increasing a population's activity levels. However, despite this knowledge and growing public awareness, most people in the western world are not engaging in sufficient regular physical activity to bring about meaningful health benefits (International Obesity Task Force (IOTF), 1998; World Health Organisation, 1998). Arguably, nowhere within any domain of human health is the gap so large between what we know and what we do. While much work has been done in the field of health behaviour change, the question still remains of how best to help more people to become more active more often.

2.2 Trends in physical activity promotion

While great progress has been made in understanding the antecedent variables, there are many factors involved in the initiation and long-term maintenance of physical activity that are not fully understood. The idea the increased physical activity equals better health is widely understood, but most health professionals would agree that sustained individual-level

behaviour change is difficult (i.e. closing the gap between what we know and what we do). At the population level, awareness of the importance of physical activity has been enhanced by social marketing campaigns in New Zealand (e.g. the 'Push Play' mass-media awareness campaign introduced in 1999), and increased levels of awareness and 'intention to be more active' have been recorded but no overall effect on actual physical activity levels was shown⁶ (Bauman, et al., 2003).

Government backed community level initiatives have also been implemented nationally. For example, Sport and Recreation New Zealand's (SPARC) Green Prescription (GRx) initiative which involves a general practitioner (GP) or practice nurse writing a physical activity prescription for sedentary patients (including phone-based physical activity counselling, face-to-face individual support and/or entry into activity groups) (Ministry of Health, 2008a). Various regional programmes also operate throughout New Zealand, some implemented by DHBs, others by NGOs and other community/cultural groups but most are small programmes with arguably limited reach, operating with limited resources.

Intervention at the population level is important in the overall effort to change sedentary lifestyles, yet the prevailing reinforcement of sedentary modern living poses a significant challenge. Population level interventions

⁶It is noted that this was not a key goal of the awareness campaign. No sustained changes in physical activity levels were seen in the Push Play serial evaluation surveys, with 38.6% of the 1999 sample reporting 5+ days activity per week, increasing to 44.5% in 2000, but declining to 38.0% in 2002 (Bauman et al., 2003).

such as media campaigns and other community programmes may not necessarily influence behaviour directly and immediately, and acute changes at the population level are less likely for complex behaviours (smoking being perhaps the most high profile example). However, the literature is beginning to amass evidence that targeted, well-executed population level campaigns can have small-to-moderate effects not only on health knowledge, beliefs, and attitudes, but on behaviours as well (Noar 2006). These small-to-moderate effects are not unimportant given the wide reach that mass media is capable of. A campaign with a small-to-moderate effect size that reaches thousands of people will have a greater impact on public health than would an individual or group-level intervention with a large effect size that only reaches a small number of people (Glasgow, 2002). However, it has been questioned whether population level interventions alone can change behaviour, thus, multiple channels, levels, and components have been suggested in order to increase the chances of success (Noar 2006).

At the individual level, education and brief psychosocial/psychological interventions have (at least to some degree) been shown to be effective in many areas of health behaviour change: including smoking cessation, changes in nutrition, and compliance with medication protocols (Burke, Dunn, Atkins, & Phelps, 2004; Gonder-Frederick, Cox, & Ritterband, 2002; Pringle, Gilson, McKenna, & Cooke, 2009). However, such behaviour change is often extremely challenging and often not maintained much

beyond the intervention period, with a tendency for individuals to regress to pre-intervention or baseline behaviours or even to progress toward more unfavourable health outcomes (rebounding) (Gonder-Frederick, et al., 2002; McKinlay, 1993). Individual-level approaches to enhancing physical activity have met with some success, however, like all individual-level approaches it can be argued that such programmes are expensive, have limited reach and make a relatively small contribution to population health over time. In attempts to address the particular limitations of both population level and individual level interventions, contemporary perspectives recognise the need for multi-level approaches, sustained over years not months, and the need for multi-sectoral policies to promote physical activity. Such multi-sectoral policies include promoting enabling environments, community involvement, and individual-level intervention (World Health Organization, 2004). In the past, ‘medical model’ interventions sometimes failed to accommodate individual differences in readiness to change, willingness to change, cultural appropriateness, barriers to equitable access, and a myriad of other socioeconomic, cognitive and psychological antecedents (Fuchs, 1998; New Zealand Ministry of Health, 2002). While it is true that modern medicine has evolved to ameliorate many acute illnesses and injuries, it still performs rather less well when faced with the increasing prevalence of ‘lifestyle diseases’ (Callahan, 2009; Fuchs, 1993, 1998; McKinlay, 1993) and the multi-faceted determinants of

health that lie outside of individuals' human biology (Lorig & Holman, 2003).

Many questions remain about how people can successfully engage and commit to sufficient levels of physical activity for optimal health, given an increasingly inactive society. Most would agree that a 'magic bullet' is unlikely and advances in the effectiveness of physical activity behaviour change interventions are likely to be incremental and the results mixed. The required behaviour change is complex and multi-faceted, and the reinforcement of sedentary modern living poses a serious challenge (World Health Organization, 1998, 2004). How people (including different ethnic groups, including migrants and refugees) adapt their physical activity participation across the lifespan, as they transition from school to tertiary education to work to parenthood and later to retirement or from one social or cultural environment to another, is not fully known. The seemingly simple question of why some people exercise and others do not remains largely unanswered. Given the ever present demand for health care services and the complex equation of access, cost and quality; learning how to maximise efficiency in the use of scarce resources is an important research goal.

3 BACKGROUND

3.1 The novel contribution of the study

Broadly, this study aims to add to the knowledge base with regard to individual-level physical activity counselling interventions in general. Specifically, the study aims to demonstrate the potential benefits of formally involving social support and social interaction, and in so doing, bridging between individual and community⁷ level interventions. More specifically, this study aims to combine Motivational Interviewing⁸ (with pro-active email follow-up) with a ‘motivational-buddy’⁹ in the context of physical activity counselling/support. A quantitative research design will be used based on a randomised controlled trial (RCT). Using a pragmatic parallel group RCT with non-blinded outcome assessment, this study will assess the clinical, social and behavioural effectiveness¹⁰ of a 12-month physical activity counselling intervention incorporating Motivational Interviewing within a motivational dyad model (buddy-system, the experimental

⁷Community in this context is viewed as the face-to-face primary groups to which individuals belong. Including – families, personal friends, neighbours and other sources of social resources, rather than the geographical location context.

⁸Motivational Interviewing has been chosen as an evidence based clinical intervention; defined as “a collaborative, person-centred form of guiding to elicit and strengthen motivation for change” (Miller et al., 2009, p. 137).

⁹There appears to be no standardised definition of a ‘motivational-buddy’, however for the purpose of this study, a ‘motivational-buddy’ is considered an individual who is paired with and then given and accepts special responsibility to support another person in initiating and maintaining a health enhancing physical activity programme. The ‘buddy’ may or may not actually participate in physical activity but fulfils, first and foremost, a social support role... depending on the needs of the ‘exerciser’.

¹⁰Broadly meaning the capability of producing an effect: in the clinical context (does the intervention ‘work’ from a process evaluation perspective and does it bring about measurable changes in participants’ language and articulation of ‘change talk?’), in a social context (does the intervention influence social engagement?), and in a behavioural context (is the experimental intervention associated with measurable behaviour change?).

intervention), compared 'head-to-head' to a physical activity counselling intervention incorporating Motivational Interviewing delivered one-to-one (active control). The question this study aims to address is, in simple terms, “Can a ‘motivational-buddy’ counselling intervention using Motivational Interviewing methods help adults to change their sedentary lifestyles and maintain this change over time (compared to Motivational Interviewing alone): the long-term goal being an improvement in fitness, health, and health-related quality of life¹¹?”

3.2 Hypothesis

It is hypothesised that experimental intervention is feasible and experimental group participants will increase their daily physical activity levels in the course of one year of intervention, and attain and maintain significant increases in cardio-respiratory fitness compared to standard care (active control) participants at 12-month follow-up. Also, it is hypothesised that experimental group participants will self-report improved health-related quality of life and report higher global and exercise specific self-efficacy.

¹¹Health-related quality of life (HRQOL) (a sub-measure of Quality of Life) is a purely subjective measure, usually assessed via validated patient-rated questionnaires (e.g. the SF-36v2). The current concept of HRQOL acknowledges that people ‘rate’ their actual situation in relation to their individual expectation. In this context, the importance of interpreting change in health status has a central role. If considering overall quality of life, other factors such as culture, environment, education and socio-economic status are also included, but such factors are usually considered beyond the scope of health care. The measurement and interpretation of Health-related quality of life data is enhanced by comparing results to valid normative data (Greenfield and Nelson, 1992). HRQOL is a concept that tries to embrace peoples’ subjective judgements of their level of health or health status, across multiple domains including: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems and mental health (Ware & Sherbourne, 1992). Broadly, HRQOL measures attempt to operationalise common (broad) definitions of health.

3.3 *Rationale*

As stated previously, the study represents an attempt to bridge the gap between individual-level (micro-system) and meso-system¹² (community level) intervention, by facilitating community level social engagement. Active social engagement has been shown to be associated with better health outcomes across a number of studies (Berkman & Syme, 1979; Glass, de Leon, Marottoli, & Berkman, 1999; Golden, Conroy, & Lawlor, 2009; Mendes de Leon, 2005; Mendes de Leon, Glass, & Berkman, 2003; Mendes de Leon, Gold, Glass, Kaplan, & George, 2001). However, much of the research to date has been conducted in elderly populations in the US and the research has largely been cross-sectional: therefore the causal effects have not been robustly tested. Notwithstanding these limitations, in investigating the relationship between social engagement and health, researchers have attempted to control possible confounders, such as socio-demographic variables, baseline physical and psychological health, and physical activity (Bath & Deeg, 2005). Convergent findings do suggest that the relationship is important. While the complex (perhaps reciprocal) physiological and psychological mechanisms presumed to be involved are not fully understood, participation in social and productive activities does appear to confer advantages beyond just improved physical fitness (Glass, et al., 1999; Mendes de Leon, et al., 2003). Mendes de Leon et al. (2003) postulated that active social engagement might positively influence health

¹²Meso-systems = face-to-face primary groups to which individuals belong ('community'), including families, personal friends, neighbours (Bronfenbrenner, 1977).

outcomes via providing “a greater sense of purpose and control, and overall self-efficacy” (s.178).

Other studies have focused on the types of ties that are most important and Mendes de Leon and Gold et al. (2001) found that only contact with friends, but not with relatives, appeared to confer a protective effect against disability. In a more recent cross-sectional study of 1,334 community-dwelling elderly participants (Golden, et al., 2009), the general themes were found to be similar. Golden et al. (2009) identified two uncorrelated social support network domains: family and social engagement. Social engagement was associated with a lower prevalence of depression, generalised anxiety disorder, cognitive impairment and physical disability, and with better quality of life, self-rated happiness and rating life as worth living ($p < 0.001$). The family domain, on the other hand, was not significantly associated with any health outcome. Golden, Conroy et al. (2009) concluded that elective relationships and social engagement appear to be the ‘active ingredients’ of social networks which in turn promote health.

While the cross-sectional nature of much of the research relating social support to health does not allow for causal inferences, adding social support to behaviour change interventions has the potential to reduce health professionals' workloads and health service utilisation, and to date, such interventions have generally been shown to be appreciated by at least part of

the patient population (Golden, et al., 2009). For the purpose of discussion, if one accepts that the relationship between social support and health *is* causal, then many questions need to be answered about exactly how social support can best be integrated into specific behaviour-change interventions and what the similarities and differences might be between the *ideal* intervention design for one type of behaviour compared to another (for example initiating physical activity compared to the cessation of smoking) (Verheijden, Bakx, Weel, Koelen, & Staveren, 2005).

Taken together, that above evidence suggests that active social engagement is important for health and that motivational-buddy relationships may confer useful effects. Therefore, self-selected peer group or intimate partner buddies, rather than or assigned buddies, may be a reasonable approach. Similar interventions could potentially be used *proactively* via implementation in workplaces, schools and universities, primary health settings and the wider community: via pre-existing channels and/or *reactively* to treat existing chronic disease. For example, the intervention is in accord with the Government's Better, Sooner, More Convenient initiative in primary health care and the intervention could be used in the context of Integrated Family Health Centres (IFHCs). The intervention could be used by nurses and other allied health workers acting as case managers for patients with chronic conditions, therefore increasing the range of care and support available for patients/whānau. Currently nine (of 70) proposals from eligible primary health care providers have been selected to move through

to the next stage of development for the purpose of implementing the Better, Sooner, More Convenient initiative. The Canterbury Clinical Networks' proposal for a whole system response (Canterbury Clinical Network, 2009) outlines a number of key elements including developing a different mix of consultations carried out by all health professionals involved (e.g. email, variable length, phone, whānau and group consultations) and developing a programme of self-management techniques for practice teams to work in partnership with patients and their families/whānau. Canterbury Clinical Networks' proposal also outlines opportunities to free up sector capacity by using the current workforce to its full potential: for example, by utilisation of the broader health care workforce beyond the doctor and nurse roles and inclusion of the patient and whānau as part of the health care team. The novel intervention could potentially be suitable for inclusion in such initiatives.

The implication for practice is potentially improved cost-effectiveness and reach. In terms of cost-effectiveness, the recruitment of volunteer community level support has the potential to reduce demand on the health care workforce. In terms of reach, community engagement and lay-participation in care is seen as a major thread in health promotion, as is the need to explore the issues and problems concerned with developing educative and supportive roles (Meyer, 1993; WHO, Health and Welfare Canada, & Canadian Public Health Association, 1986). Knowledge and norms may be transmitted within a community and intervention effects may

generalise or ‘rub off’ on volunteers and diffuse throughout the community. While the study was conducted in a university setting¹³, the overall focus was proof-of-concept, that is, to demonstrate that buddy-Motivational Interviewing (buddy-MI) is potentially useful in encouraging and supporting physical activity adoption and maintenance possibly across a range of similar settings¹⁴. The term buddy-Motivational Interviewing, as used here, refers to a group MI intervention model wherein the therapist works with a group of two members (the smallest possible social group) in which the participants are guided to form a therapeutic relationship, and in which other basic elements of social exchange such as reciprocity, accountability, and role-modelling may occur and be channelled to positive effect. There appears to be no standardised definition of a motivational-buddy but social support, such as buddy systems, has been proposed as an effective method to increase the adoption and maintenance of moderate level physical activity (Booth, Bauman, Owen, & Gore, 1997; Carron, Hausenblas, & Mack, 1996; Leslie, et al., 1999; McAuley, Courneya, Rudolph, & Lox, 1994; Wallace, Buckworth, Kirby, & Sherman, 2000) and attempting to influence and enhance pre-existing supportive relationships is one component of the intervention. The study aims to demonstrate a

¹³The reasons being more to do with the practicalities of conducting the trial (i.e. recruitment) rather than testing any specific setting.

¹⁴ Settings considered similar in this context are those in which a suitable organisational structure exists, for example workplaces, schools and universities, church groups, clubs, and a range of health-care settings. Health-care settings could include Integrated Family Health Centres, inpatient and outpatient clinics (e.g. diabetes centres, cardiac rehabilitation clinics, weight management clinics) and also GP based clinics and Māori health-care settings.

synergy that is more effective over time than usual-care, by potentially improving long-term individual-level *and* community level health outcomes.

3.4 The function of the buddy system

In the study, the motivational-buddy is intended to be an individual who is paired with and then given and accepts special responsibility to support another person in initiating and maintaining a physically activate lifestyle programme. Perhaps the most common understanding of the buddy system is that of one person teaming up with another to actually participate in an activity (e.g. walking/running buddy, gym partner, an Alcohol Anonymous sponsor, or whatever). However, in this trial, the motivational-buddy may or may not actually participate in physical activity, but first and foremost, fulfils a social support role (a counselling-buddy role), depending on the need of the participant. Social support has been described in terms of perceived support¹⁵, enacted support¹⁶ and social integration¹⁷ (Barrera, 1986) and it is intended that the motivational-buddy role be flexible. And so, the motivational-buddy may enhance perceived support, enacted support or social integration, in any combination.

In everyday life, intentions to adopt a particular behaviour do not necessarily result in action and typically a medium-to-large change in

¹⁵The subjective judgment that family and/or friends would provide quality assistance if required

¹⁶Emphasises specific supportive actions

¹⁷The number or range of different types of social relations

intention leads only to a small-to-medium change in behaviour, if at all. However, social support may enhance this relationship. Carron et al. (1996) found that social influence generally was found to have a small to moderate positive effect (i.e., effect sizes $d = 0.20$ to $d = 0.50$) on exercise behaviours, (adherence and compliance), cognitions (intentions and efficacy), and affect (satisfaction and attitude). However, moderate to large effect sizes (i.e., .50 to .80) were found for family support/attitudes about exercise, and important others' attitudes about exercise. Interestingly, the effects of social influence via 'important others' and the presence of a 'task-cohesive' group were almost twice that of family support (Carron et al., 1996) (see also Mendes de Leon et al. 2001 and Golden et al. 2009).

3.5 The role of Motivational Interviewing

Motivational Interviewing (MI) involves a client-centred approach to consultation and there is now considerable evidence (over 160 randomised trials) for the effectiveness of MI in the treatment of substance abuse, as well as a number of other settings and problem areas including family practice, chronic care, diabetes, cardiac rehabilitation, oral health (emerging), and diet and exercise (for two recent reviews of randomised trials see Burke, Arkowitz, & Menchola, 2003; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010; Martins & McNeil, 2009). The goal of MI is to strengthen the importance of change from the client's perspective (Burke, Arkowitz, & Menchola, 2003). Fundamentally, MI involves the activation of peoples' own motivation for change and, unlike some other talking

therapies or clinical interactions, it involves guiding and directing rather than confronting but is active not passive. Motivational Interviewing has the potential to facilitate long-term exercise behaviour change and positively influence peoples' health (see p.62 for a more detailed review of MI theory and practice).

3.6 Summary

The significance of the study is that it is an attempt at 'widening' the individual level intervention approach by bridging between health promotion, prevention, treatment, and community development and focusing on empowerment and inter-dependence (rather than dependence). The broad theoretical underpinnings for this approach are presented in the following review of the literature. The purpose of the study is to promote health behaviour change: not only in an individual, but at the interface of the individual↔social group. Thus, the novel intervention is not only aimed at influencing behaviour at this interface but it is also aimed at strengthening social cohesion, and propagating an intervention 'ripple effect' that spreads through both new and existing channels.

4 LITERATURE REVIEW:

PART ONE

4.1 *A brief overview of relevant theory*

This section briefly overviews the broad theoretical underpinnings for the ‘style’ of this novel intervention including learning theory, goal theory, health behaviour change theories, and other relevant contributions including environmental considerations, self-management theory and Motivational Interviewing. This overview is an attempt to briefly collate and synthesise the relevant background literature and show the rationale for focusing on particular constructs and intervention elements, in developing the protocol for the study. **Table 1** lists the broad theoretical contributions reviewed.

Table 1: A brief summary of the broad theoretical contributions to the novel intervention

Theorist	Contribution
Learning theory	
Vygotsky (1987)	Social cognitive theory/peer learning
Goal theory	
Locke & Latham (1990a, 2002)	More than 35 years of empirical research on goal theory
Behaviour change theories	
Fishbein and Ajzen (1975)	Theory of Reasoned Action (TRA)
Ajzen (1991)	Theory of Planned Behaviour (TPB)
Bandura (1977; 1986; 1997; 1998)	Social Cognitive Theory (SCT)
Prochaska & Di Clemente, (1984)	Transtheoretical Model of Behaviour Change (TTM)
Janz and Becker (1984)	Health Belief Model (HBM)
Fishbein (2000)	The Integrated Model of Behaviour Change (IM)
Other	
Brofenbrenner (1977)	Social environment/community
Lorig & Holman (2003)	Self-management theory and chronic illness care
Festinger (1957)	A theory of cognitive dissonance
Miller & Rollnick (2002)	Motivational Interviewing

4.2 *Learning theory*

Patient education (and/or increasing health literacy) is very often seen as a first-line or prerequisite intervention for improving self-care. Vygotsky's (1896–1934) theories of learning fit within the 'social constructivism' paradigm and thus emphasise the importance of the learner being actively involved in the learning process and that learners essentially construct their own understanding (Huang, 2002). Vygotsky proposed that a child's learning is optimised when a teacher (or more capable peer) extends the child's learning (into the zone of proximal development) with feedback and direction that is pitched 'just ahead' of the child's current stage of development (Vygotsky, Rieber, Carton, & Minick, 1987, original works published in 1934). It is now understood that the same principle can also be applied to adults' novel learning of new health-related behaviours (American Psychological Association, 1993; Bonk & Cunningham, 1998; Huang, 2002; Knowles, Holton, & Swanson, 1998). Two elements of Vygotsky's theory are potentially relevant to health-care interventions: firstly, the use of 'peer teachers' and secondly, the use of feedback and direction. The term 'scaffolding' is used to illustrate the structure by which a more experienced person may provide instruction or guidance just beyond the level of what the learner can do alone. Scaffolding may apply between a practitioner and client. An important aspect of scaffolding instruction is that the scaffolds are temporary. As the learner's abilities increase the

scaffolding provided by the ‘more knowledgeable other’ is progressively withdrawn.

The ‘leaning’ that might take place in a physical activity context includes strategies to increase self-efficacy, strategies to engage peer support, goal setting skills, time management skills, specific exercise or sport related skills, or whatever is needed. And so, for enduring change, people must develop independence rather than dependence, as in the long term, health systems can only ever provide finite resources and support. For a health-care system to be sustainable, people must learn the appropriate skills that enable on-going and effective self-care.

4.3 Goal theory

The ability to set (high quality) personal goals for health promoting behaviours is widely recognised as being an important self-management skill. Many researchers have investigated the structure of goals and how they influence human behaviour, including health-related behaviours. Much of the early goal-performance research was conducted within the fields of education, industrial and organisational psychology. In later work, investigators translated many of the founding principles of goal theory to personal health behaviour change, health promotion, and the protection of wellbeing (Locke & Latham, 1984, 1990b; 2002). Early studies include Ryan’s (1958) pioneering work in industrial psychology: drives, tasks, and the initiation of behaviour. Ryan demonstrated the seemingly simple

principle that ‘conscious goals affect action’. Other theorists have also contributed to the knowledge base; Piaget (1981) expanded the definition of goals and stated that goals (or interests) “represent the point of juncture between two distinct systems. It is where the system of valuations and the system of energetic regulation come together” (Piaget, 1981, p. 34). A contemporary view is that “Goals determine the direction, intensity and duration of action” (Locke, 2001, p.304). Greater goal-directedness is associated with higher levels of health promoting and health protective behaviours (Bandura, 1998; Heath, Larrick, & Wu, 1999; Locke & Latham, 2002). Whatever the domain of human functioning, goals affect performance via four foundational mechanisms: (1) the directive function (focusing and directing attention and effort), (2) the energising function (goals may increase the intensity of cognitive and physical effort), (3) by engendering persistence (goals may prolong effort), and (4) by prompting action (via the indirect effects of increasing arousal and fostering engagement in discovery and learning strategies) (Locke & Latham, 2002). Perhaps the most studied aspect of goal theory is the relationship between goal difficulty and performance. The finding that higher level goals lead to higher performance is one of the most replicated in the applied psychology literature (Locke & Latham, 2002). Goals refer to the attainment of a specified level of proficiency on a specified task (or tasks); usually within a specified time frame (Locke & Latham, 1990). For example, physical activity recommendations can be taken as specific goals: at least 30 minutes

a day (level) of at least moderate intensity physical activity (task) on five or more days of the week (time/frequency).

No overview of goal theory can be complete without referring to the importance of commitment. Commitment has been defined as “a state of being in which an individual becomes bound by his actions and through these actions to beliefs that sustain the activities and his own involvement” (Salancik, 1977, p.62). Commitment is often described with reference to its function after a decision to pursue a goal is made but commitment processes are also important before the intention to pursue a goal forms. Bagozzi (1992) therefore refers to commitment as “the binding of the individual to (1) the decision to try to achieve a goal or performing a behaviour and (2) the decision to use particular means” (p.199).

Commitment is a moderator of the goal difficulty-performance relationship, therefore methods of increasing goal commitment become important in helping people to change their behaviour. Commitment to one's goals is contingent on two main factors (1) one must believe that one can make progress toward one's goals (self-efficacy) and (2) one must believe that the goal is important (and for a goal to be important, it must be tied to an important value) (Locke & Latham, 2002). A number of personality and situational factors have also been demonstrated to influence goal commitment: commitment has been found to depend on the explicitness of the act, the revocability of the act, the importance of an act to the individual,

the degree of public visibility of the act (publicness)¹⁸, the number of acts performed, peer group influence, incentives/rewards, self-efficacy, goal conflict (negatively), personal origin and values (Bagozzi, 1992; Locke & Latham, 2002). Rogers (1964) observed that by exploring values within a therapeutic relationship, common value directions emerge: “These common value directions are of such kinds as to enhance the development of the individual himself, or of others in his community ...” (Rogers, 1964, p.155). Although the influence of values on behaviour is not absolute, focusing on values and helping people to identify discrepancies (cognitive dissonance)¹⁹ between their current-self and ideal-self can help to strengthen their motivation for change (Festinger, 1957; Miller & Rollnick, 2002).

Based on the simple premise that ‘conscious goals affect action’, teaching goal setting skills would appear to be an essential ingredient to behaviour change and ought to be addressed in any physical activity promotion intervention.

4.4 Behaviour change theories and models

There is growing evidence that well designed and focused theory-based health behaviour change interventions can be effective across a range of domains. However, there is a lack of consensus as to which theory best

¹⁸ Publicness can be described as the extent to which an individual perceives that other people are aware of his or her goal/s (particularly ‘significant others’).

¹⁹ Festinger’s (1957) theory of cognitive dissonance holds that cognitive dissonance manifests as a psychological tension caused by holding two contradictory ideas simultaneously. The theory of cognitive dissonance proposes that people have a motivational drive to reduce dissonance by changing (one or more of) their attitudes, their beliefs (or justifications), and/or behaviours.

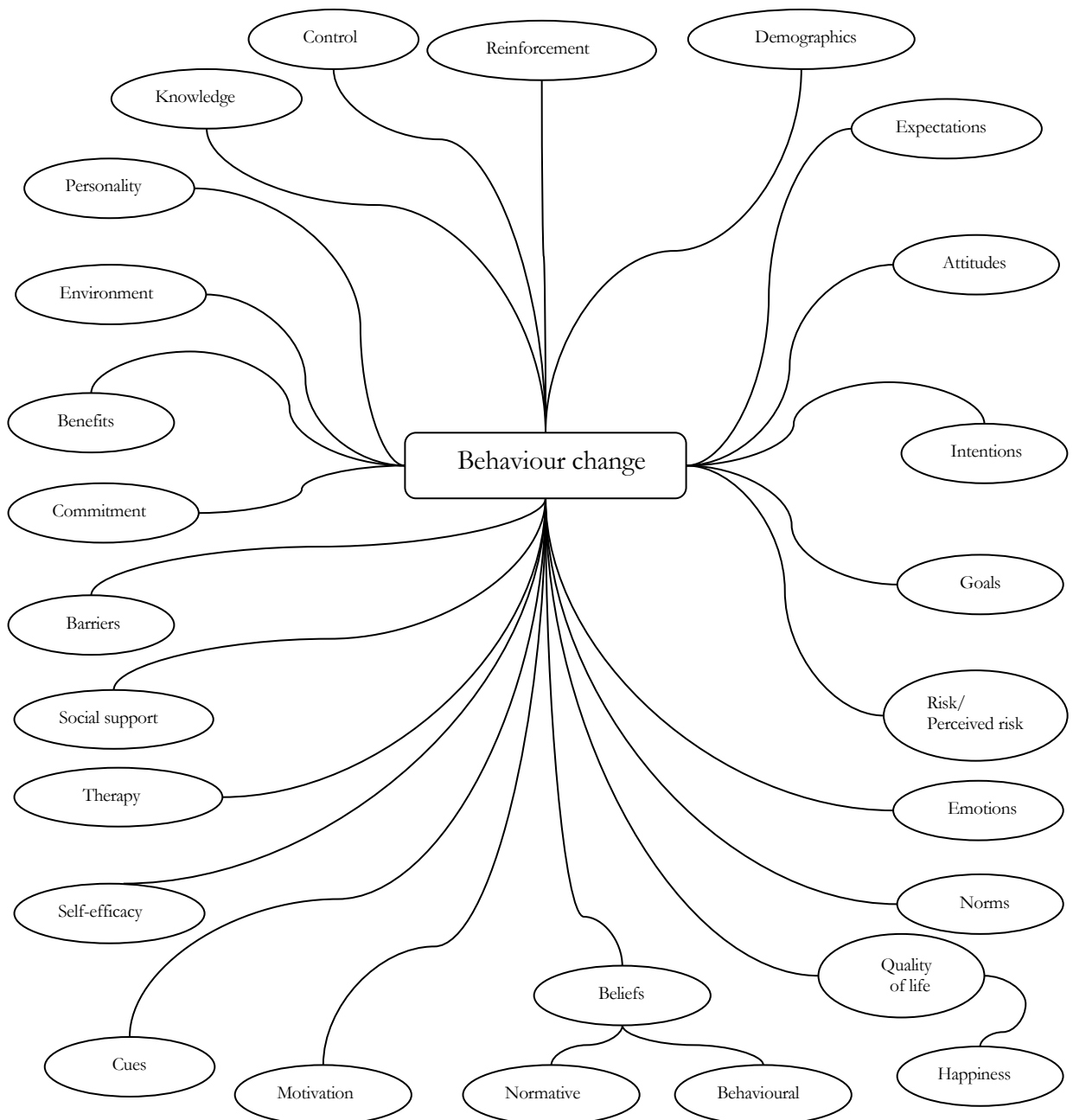
predicts health behaviour change and exactly how researchers should translate theory into useful interventions designs. It can be argued that all of the mainstream theories have strengths and weaknesses, and so all have something to offer the interventionist ... perhaps in part dependant on the target behaviour. Common health behaviour theories (HBTs) include (ordered in **Table 2** roughly according to the frequency of their use, as reported in the literature): the Theory of Reasoned Action (Fishbein & Ajzen, 1975), the Theory of Planned Behaviour (Ajzen, 1991), Social Cognitive Theory (Bandura, 1986), the Transtheoretical Model (Prochaska & DiClemente, 1982), the Health Belief Model (Janz & Becker, 1984b), and more recently the Integrated Model (Fishbein, 2000; Fishbein & Yzer, 2003)²⁰. Several additional theories have also been developed or adapted for specific disease/behaviour applications.

As Noar et al. (2008; 2005) suggest, much remains uncertain as to which health behaviour theories or elements represent the ‘best fit’ with different behaviours and contexts. That is, are certain behaviour change theories better predictors of addictive behaviours as opposed to non-addictive behaviours; ‘one-time’ behaviours (e.g. vaccinations) as opposed to behaviours that must be adopted and maintained over time (e.g. exercise); or cessation behaviours (such as smoking)? It may be that certain theories are more applicable to cultural groups characterised by individualism,

²⁰ The Integrated Model (IM) is essentially an evolution of the TRA: with self-efficacy, demographics and personality characteristics added.

compared to cultures characterised by collectivism (where self-efficacy may be more important in the former, and beliefs and norms be more important predictors of behaviour in the latter) (Noar & Zimmerman, 2005). **Figure 2** shows many of the constructs thought to influence health behaviour change. The following overview summarises the relevant contributions of selected health behaviour theories and their relevance and/or application to the design and implementation of physical activity promotion in interventions and indeed health behaviour change interventions in general.

Commonly described constructs in health behaviour change theories and models



Compiled from: Ajzen & Madden (1986), Bandura (1977; 1986; 1997; 1998), Fishbein (2000), Fishbein & Azjen (1975), Fishbein & Azjen (2010), Janz & Becker (1984), Locke & Latham, (1990), Lorig & Holman (2003), Noar (2003; 2005; 2007), Prochaska and Di Clemente (1982).

Figure 2: Commonly described constructs in health behaviour change theories and models

Table 2: Similar or identical constructs within five common health behaviour models

Concept fields	Concept tenets	TRA	TPB	SCT	TTM	HBM
Attitudinal beliefs	The perceived positive benefits must outweigh the perceived negative costs of the behaviour.	Behavioural beliefs and derived attitudes	Behavioural beliefs and derived attitudes	Outcome expectations expectancies	Pro and con evaluations, decisional balance	Benefits, barriers and health motivation
Self-efficacy, control beliefs	Belief in one's ability to perform a behaviour is often necessary for its execution.	-	Perceived behavioural control components	Self-efficacy	Self-efficacy (and temptation as a negative indicator, plus self-liberation?)	Self-efficacy (in later version)
Normative beliefs and norm related activity influences	Belief that significant others desire one to adopt a behaviour. Beliefs that peers have adopted the behaviour. Positive reinforcements, behavioural reminders.	Normative beliefs and motivation to comply	Normative beliefs and motivation to comply	Social support Social environment/ norms; modelling reinforcement	Helping relationship related processes Social liberation related processes Reinforcement management and stimulus control processes Dramatic relief processes	Cues from family, friends and media Cues from mass media and other sources
Risk related beliefs and emotional influences	One feels at risk of a defined disease or condition, with will inflict negative consequences.					Perceived susceptibility
Intention setting and commitment planning	One has formed intentions and/or commitments in relation to achieving a specific behaviour.	Behavioural intentions	Behavioural intentions		Self-liberation and social liberation processes, contemplation, preparation and action stages of behavioural change	

Abbreviations: HBM = Health Belief Model, SCT = Social Cognitive Theory, TPB = Theory of Planned Behaviour, TRA = Theory of Reasoned Action, TTM = Transtheoretical Model. Adapted from: Noar & Zimmerman (2005) and Noar (2007).

4.4.1 *The Theory of Reasoned Action*

Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) suggests that behaviours can be understood by examining individual's attitudes about the behaviour, their perceptions of social norms regarding the behaviour and their intentions to engage in the behaviour. The theory suggests that we engage in behaviours when we hold positive attitudes, positive social norms and strong intentions toward the behaviour. The theory is essentially focused on behavioural prediction and suggests that knowledge of these individual-level factors is key in terms of making behavioural predictions.

4.4.2 *The Theory of Planned Behaviour*

According to the Theory of Planned Behaviour (Figure 3) (Ajzen, 1991), intention is the most proximal predictor of behaviour. The Theory of Planned Behaviour

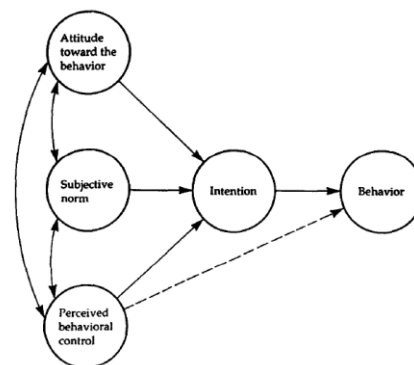


Figure 3: Theory of Planned Behaviour
Source: Ajzen, (1991)

(TPB) extends the TRA (see previous) by adding the construct of perceived behavioural control. Thus, the cognitions that affect a specific intention are attitudes, subjective norms, and perceived behavioural control (perception about being able to perform a specific behaviour). Self-efficacy and behavioural control are seen as almost synonymous constructs.

However, self-efficacy is more precisely related to one's competence and to future behaviour. Ajzen (1991) proposed that together, these perceptions account for considerable variance in actual behaviour. Despite the TPBs seemingly simple structure, a recent systematic review concluded favourably that the TPB may still have a valuable contribution to make to developing effective interventions aimed at behaviour change, especially among individuals where motivation to act cannot be taken for granted (Hardeman, et al., 2002).

4.4.3 Social Cognitive Theory

Bandura's influential work on Social Learning Theory (SLT) and later; Social Cognitive Theory (SCT) (Bandura, 1977; Bandura, 1986, 1997, 1998) highlighted the importance that self-efficacy plays in

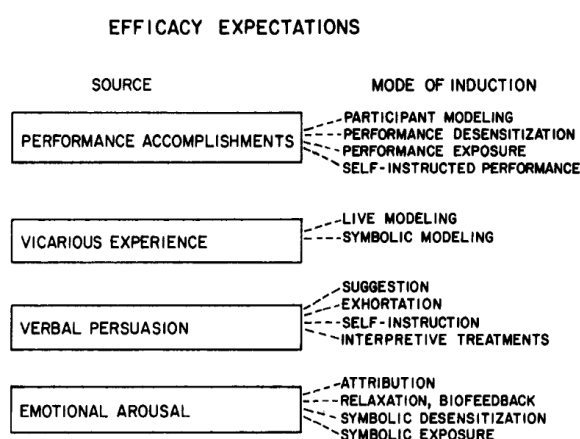


Figure 4: Major sources of efficacy information and the principal sources through which different modes of treatment operate
Source: Bandura (1977)

influencing behaviour. Bandura (1977) proposed that a self-efficacy belief is a belief that one can perform the behaviour that produces a specific outcome, and that these self-efficacy beliefs are largely determined through personal experiences. The self-efficacy concept provides a framework in

which to better understand peoples' capacity to practice health-promoting behaviours. Bandura (1977) proposed that self-efficacy is modifiable via information from four principal sources (**Figure 4**): performance mastery (mastery experiences), vicarious experiences (modelling, including symbolic), verbal persuasion (including self-instruction) and modifying and managing physiological and/or emotional states. Self-efficacy beliefs are cognitions that influence whether health behaviour change will be initiated, how much effort will be expended, how high goals are set, and how long effort will be sustained in the face of obstacles and failures (Bandura, 1998).

In a health behaviour-change context, the methods of mastery experience, vicarious experience and social persuasion, are generally those most commonly used. Social persuasion may occur for example, when a participant in a sports team or exercise group feels compelled by his or her peers to actively engage in physical activity or when peers provide encouragement and reinforcement of a behaviour change. Self-efficacy beliefs are not just limited to behaviour, however, as they may include beliefs relating to the self-regulation of one's cognitive processes and/or affective states and one's ability to influence one's environment (reciprocal determinism) (Bandura, 1968).

Reciprocal determinism describes the relationship in which variable 'x' may be related to variable 'y' at the same time as variable 'y' is related to variable 'x'. For example, initial success in adhering to an exercise

programme may result in feelings of increased fitness, and feeling fit may lead a person to further success in maintaining the exercise programme, resulting in still greater increases in fitness (and so on). Social cognitive theory posits that behaviour is influenced by individual factors in combination with social factors and the physical environment (Bandura, 1986).

Social cognitive theory postulates that we anticipate and develop expectancies, using knowledge and past experience, to form beliefs about future events and our abilities and behaviours (Bandura, 1986, 1997). Self-efficacy has been demonstrated to affect peoples' choice of goal level, with higher self-efficacy being associated with higher level goals and hence higher performance. In the context of health, self-efficacy influences the adoption of healthy behaviours, the cessation of unhealthy behaviours and the maintenance of effortful behavioural changes (Maddux, 2001).

4.4.4 The Transtheoretical Model

Prochaska and Di Clemente's (1982; 1983, 1984) Transtheoretical Model (TTM) is one of the most widely recognised and adopted health behaviour change models. The TTM (**Figure 5**) is an integrative model of intentional behaviour change, originally developed in the field of smoking cessation. The central organising construct of the TTM is the stages of change (hence the TTM is often referred to as the 'Stages of Change' Model). Proponents of the model highlight the importance of the stage schema because it

represents a temporal dimension. Change implies phenomena occurring over time and this aspect has often been largely ignored by alternative theories (behaviour change often being seen as an event). The TTM change process involves progress through a series of five stages: (1) pre-contemplation in which people are not intending to take action, (2) contemplation, in which people are intending to change in the next six months, (3) preparation in which people are intending to take action in the immediate future, (4) action in which people have made specific overt modifications in their lifestyles within the past six months and finally (5) maintenance in which people are working to prevent relapse and continue their change. A central principle regarding the application of the TTM is that interventions should be tailored or 'stage-matched' to individuals within the target population, as individual's 'readiness to change' may differ (Prochaska & DiClemente, 1982).

Although the model is most widely known for the idea that individuals pass through five stages in changing their behaviour, the model also incorporates the additional constructs of 'decisional

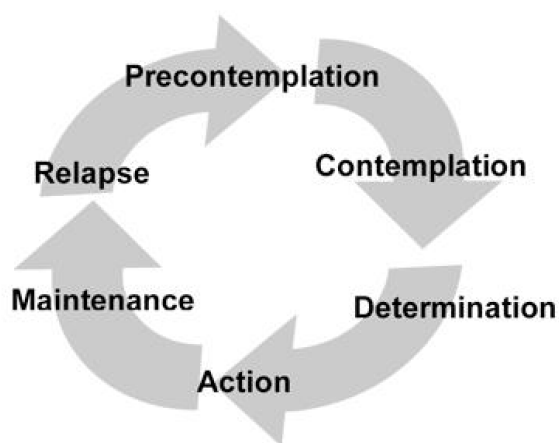


Figure 5: The TTM or 'Stages of Change' model.
Source: Prochaska and Di Clemente (1982).

balance' and 'self-efficacy' and also the ten processes of change (often

overlooked). The decisional balance construct reflects the individual's relative weighting of the importance of the pros and cons of a new behaviour versus the 'status quo' and the self-efficacy construct is adopted from Bandura's SLT (1977). Both decisional balance and self-efficacy are said to influence stage progression. During progression through the 'five stages of change', ten different social and psychological processes of change are thought to be important and these processes interact (roughly sequentially) with stage progression. The processes of change were derived from an analysis of leading models of psychotherapy and are grouped into ten classes of strategies that people commonly use in trying to change their behaviour or in protecting their current behaviour from relapse. The ten strategies are consciousness raising; dramatic relief; environmental re-evaluation; self-re-evaluation; social liberation; counter conditioning; helping relationships; reinforcement management; self-liberation; and stimulus control (Velicer, Prochaska, Fava, Norman, & Redding, 1998).

While the TTM has been applied extensively, across a range of problem behaviours, it has also been subject to fierce criticism for a lack of validity. The majority of researchers and virtually all criticisms of the TTM have focused on the stages of change component (Armitage, 2009). Bandura (1998) points out that the stages, or pseudo-stages as he describes them, are simply arbitrary subdivisions that attempt to partition 'differences in degree' into meaningful categories or stages. Bandura (1998) argues that the stages are simply descriptive of typical behaviour, and that the stages are only

loosely linked to the determinants of the typical behaviour observed in any one particular stage. Bandura argues therefore, that stage-based interventions may not necessarily target the determinants of specific health behaviour/s appropriately. However, Bandura (1989) concedes that the TTM stage scheme may serve to remind health professionals that some people in fact have little interest in changing their health behaviours, while others are more ready and more amenable to change. Further, it has been demonstrated empirically, and is generally accepted, that people who are in a more advanced stage are more likely to have changed their behaviour at follow-up, compared to people in an earlier stage (Di Clemente, 2003; 2005).

Other criticisms of the TTM have been somewhat less circumspect, notably West's (2005) call to abandon the TTM completely. West (2005) argues that the TTM (and most other social cognition models) focuses unduly on conscious decision-making. West (2005) also asserts that this knowledge of 'readiness to change' offers no more than simple common sense, and stage progression is not necessarily accompanied by a change or increase in behaviour. For example, advancing from the action stage to the maintenance stage requires only the passage of an arbitrary period of time, usually six months. In response to such criticism, DiClemente (2005) suggests that such views on the shortcomings of the TTM are "true only for those treating the model as a religion and not a heuristic model to explore the change process" (p. 1048).

Given that the stages of change component of the TTM has received such fierce criticism, it is perhaps surprising that relatively few ‘match-versus-mismatch’ experiments have been conducted (and the findings from these experiments to date are at best ‘mixed’) (Armitage, 2009). Armitage (2009) argues that the processes of change have been relatively neglected by researchers, despite the fact that they potentially provide valuable insight for the design of behaviour change interventions. Although aspects of the TTM may be conceptually controversial, from a practical perspective, using the stages of change to segment audiences might have some merit, as it is generally thought desirable to be able to target interventions at the people who are most likely to benefit. Armitage (2009) points out that governments in particular are interested in promoting policy through what social marketers describe as ‘audience segmentation’ (dividing message recipients into groups whose motivations and values are thought to be similar). Given that the stages of change summarise a large number of psychological variables and provides a means of separating people into groups, the TTM might offer more in terms of audience segmentation than current approaches based on demographic factors that are not directly amenable to change (Armitage, 2009). At a more simple level, Hodgins (2005) suggests that the process of ‘self-staging’ may provide a useful change schema that may assist people to organise their thoughts about change, that is, self-labelling may be important in maintaining behaviour change. The TTM has a number of attractive features including its intuitive appeal, its links to practice, and

(at least to some degree) it provides some insight into the processes of change. However, as Armitage and Connor (2000) point out, while it suggests methods for moving people from one stage to the next – we are told little about how people change and why some individuals will be successful and others not.

4.4.5 The Health Belief Model

The Health Belief Model (HBM) is a psychological model that attempts to explain and predict health behaviours by focusing on the attitudes and beliefs of individuals (Davidhizar, 1983; Rosenstock, 1974). Becker (1974) developed the concepts of the health belief model by expanding upon the works of Reoenstock (1966) who studied individuals' reasons for not participating in health-screening programs (**Figure 6**).

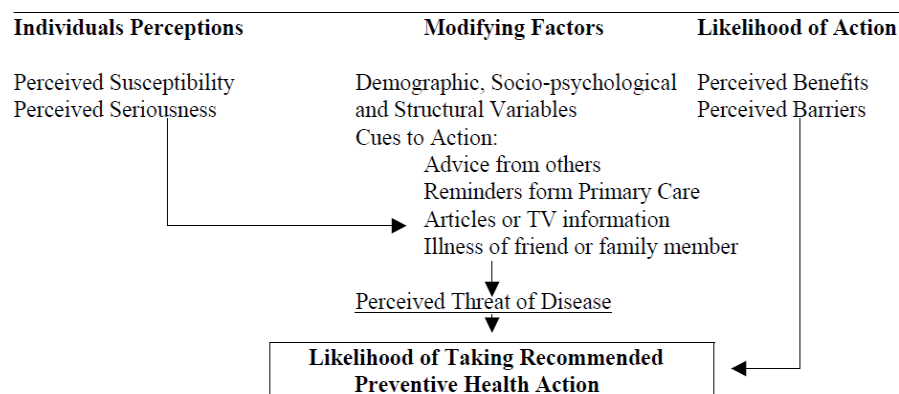


Figure 6: The Health Belief Model

Source: Becker (1974)

Note: Self-efficacy is now added to revised versions of the HBM (Rosenstock, Strecher, & Becker, 1988).

The key theoretical components of the HBM are: perceived susceptibility; perceived severity; perceived threat; perceived benefits; perceived barriers; self-efficacy; expectations; cues to action; and demographic and socio-economic variables. The HBM (**Figure 6**) is based upon the idea that an individual must have the willingness to participate in health interventions and believe that being healthy is a highly valued outcome. Perceived susceptibility is one's subjective perception of the risk of contracting a health condition and perceived severity concerns the seriousness of

contracting an illness or of leaving it untreated. The perceived benefits reflect belief in the effectiveness of strategies designed to reduce the threat of illness and perceived barriers are the potential negative consequences that may result from taking particular health actions, including physical, psychological, and financial demands. Modifying factors include demographics/structural variables and cues to action or events that motivate people to take action, and self-efficacy (the belief in being able to successfully execute the behaviour required to produce the desired outcomes).

While there has been widespread empirical support for the HBM, in particular its individual components (Janz & Becker, 1984a), meta-analysis (Harrison, Mullen, & Green, 1992) has shown weak effect sizes making conclusions about the predictive validity of the HBM difficult. Subsequently, Sheeran and Abraham's (1996) review of the HBM concluded that all HBM variables correlated only weakly with behaviour and that the weak predictive validity of the HBM was a function of poor definition of constructs, and a lack of combinatorial rules.

4.4.6 The Integrated Model

From a review of the popular HBTs, it can be seen that all have their strengths and weaknesses and all contain a variety of constructs: some are unique but many are identical or overlapping. Expanding on these previous theories, Fishbein (2000) and Fishbein and Yzer (2003) reasoned that there are only a limited number of variables that need to be considered in predicting and understanding any given behaviour. Fishbein and Yzer (2003) propose that these variables are contained in three existing theories: the Health Belief Model, Social Cognitive Theory and the Theory of Reasoned Action. Fishbein's Integrated Model of behavioural prediction

(IM) (**Figure 7**)

brings together
these variables
and focuses on
changing beliefs
about
consequences,

normative

issues, and

efficacy with respect to a particular behaviour. According to the integrated model, any given behaviour is likely to occur if one has a strong intention to perform the behaviour, if a person has the necessary skills and abilities

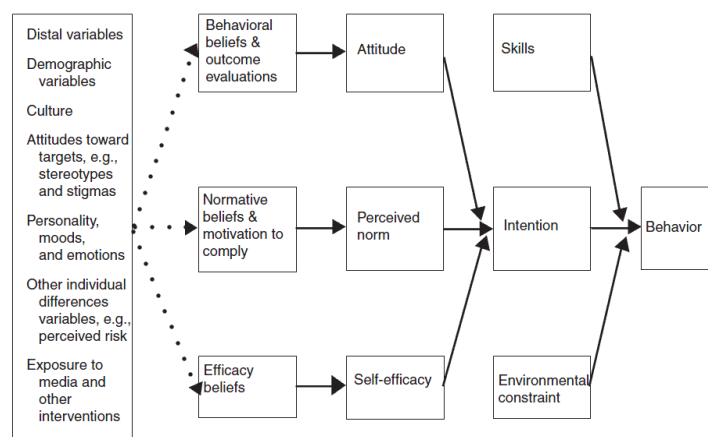


Figure 7: The Integrated Model
Source: Fishbein and Yzer (2003)

required to perform the behaviour, and if there are no environmental constraints preventing behavioural performance.

The immediate implication of this model is that very different types of interventions will be necessary for people who have formed an intention but are unable to act upon it, than for people who have little or no intention to perform the recommended behaviour. Essentially, Fishbein and Yzer (2003) suggest that people do not act upon their intentions because they lack the skills to perform the behaviour or because there are environmental barriers that hinder performance, or both. Fishbein and Yzer (2003) suggest that the IM can be applied to health-related behavioural research and to the future development of behavioural interventions, and in particular, the IM can be useful in identifying the critical determinants of a given intention or behaviour as well as the critical beliefs underlying these determinants. The IM could be used to guide the design of future physical activity interventions or as a 'check list' template to be applied to existing programmes for the purpose of identifying programme strengths and weaknesses.

4.4.7 Social ecologic perspectives

Many behavioural theories and models include the influence of the environment and/or normative beliefs and norm-related activity influences. A social ecologic perspective (Bronfenbrenner, 1977) acknowledges multiple levels of behavioural determinants, including individual, interpersonal,

organisational, and community, as well as both social and physical environments at various levels (McLeroy, Bibeau, Steckler, & Glanz, 1988). In Brofenbrenner's 'ecological model', behaviour is viewed as being affected by and effecting multiple levels of influence. Brofenbrenner (1977, 1979) defined these levels as micro-level, meso-level, exo-level and macro-level (or 'systems'). In Brofenbrenner's terminology, the micro-level refers to face-to-face interaction with family, friends and colleagues (or individual level); the meso-level describes interrelations between the individual and various settings and contexts (e.g. the family home, school, workplace, church) and is the 'system of microsystems'; the exosystem describes the wider social system in which the individual exists (e.g. the influences of socio-economic and employment factors); and the macro-system describes cultural beliefs, values, traditions, laws, and policy-level influences.

Some critics see 'life-style' interventions as promoting a victim-blaming ideology, by neglecting the importance of social influences on health and disease (McLeroy, et al., 1988). The social ecological perspective assumes that appropriate changes in the social environment will produce or at least enable changes in individuals, and that the support of individuals in the population is essential for implementing environmental changes (McLeroy, et al., 1988). Social support is a general classification that encompasses at least three distinct types of support: perceived support, enacted support and social integration (Barrera, 1986). People with high perceived-support believe that they can count on their family and friends to provide quality

assistance during times of trouble. Enacted support involves specific supportive actions (e.g. accompanying an exercise buddy to a fitness class) and social integration refers to the number or range of different types of social relations, such as marital status, siblings, and membership in organisations (Barrera, 1986).

Programme designers should consider the degree to which an intervention can increase social integration. That is, the potential a programme offers for enabling people to expand their existing range of face-to-face contacts and to access important social resources, via existing or expanded social networks.

4.4.8 Network phenomena

Network phenomena are receiving increased attention in the field of health-care (Smith & Christakis, 2008). The existence of social networks means that people and events are interdependent and that health and health-care can transcend the individual in complex ways (Christakis, 2004). People who are ‘connected’ influence each other’s health. The most well-known example is that the death of one spouse increases the risk of death in the other, and this has been observed across numerous societies and among various social and demographic groups (Lillard & Waite, 1995; Schaefer, Quesenberry, & Soora, 1995). Since participants in behaviour change programmes are invariably connected to others, via social network ties, individual level interventions may therefore confer meaningful health

effects in a wider population. These collateral health effects, which transfer to others, are known as externalities. For example, both smoking cessation and obesity have been seen to spread in a large network: in a ‘peer-to-peer’ fashion, transmitted by spouses, relatives, friends and co-workers (Christakis & Fowler, 2007; Christakis & Fowler, 2008). In both studies, Christakis and Fowler (2007; 2008) observed that the reach or influence of clusters within the network typically extended up to three degrees of separation (the social distance between subjects represented by degrees of separation) but by the fourth degree of separation, the relationship was no longer detectable.

The observation that people are embedded in social networks suggests that both negative health behaviours and health promoting behaviours might spread over a range of social ties. While the exact mechanisms of action are not fully understood, the influence of ‘transmitted values’ may alter a person’s perceptions of their own risk of illness, and their norms about the acceptability of and tolerance for certain health-related behaviours (both good and bad).

The existence of collateral health effects and the fact that each individual may be connected to numerous others, including relatives, friends, neighbours, and co-workers, implies that the efficiency of individual level intervention programmes may be greater than a cursory assessment might suggest. Similarly, the potential for negative health behaviours and

unintended consequences to spread through a population should not be underestimated. To fully explore such effects, researchers and programme evaluators need to use expanded data collection methods that capture not only the participants' health outcomes but also data relating to those within his or her social networks.

4.5 Individual versus group therapy

Peer support and 'group work' are common in the area of substance abuse treatment, smoking cessation, diabetes self-management education, and to a limited extent physical activity promotion and weight loss programmes. A notable example is Alcoholics Anonymous (AA), a well-established international organisation which offers a brief, structured, small group therapy intervention within a model of abstinence and spirituality. A critical component is sponsorship, wherein an AA member works with newer members to orient them to the programme, offer feedback, and serve as a role model of recovery (Alcoholics Anonymous, 2001). Another approach in substance addiction is the 'therapeutic community' which uses the institution ('the community') as an aid to recovery, and patients are also supported by the wider external community in which the facility is located (Kennard, 2004). Other variations include predominantly 'work-based' therapeutic programmes and other 12-step interventions available that do not include spirituality, and these are often labelled Twelve Step Facilitation (TSF). A recent Cochrane review found that such approaches may help patients to accept treatment and keep patients in treatment more than

alternative treatments (Ferri, Amato, & Davoli, 2006, p.2)). In one diabetes care example, significantly improved patient-level health outcomes were achieved after the exact same programme content had been delivered in a group setting compared to that achieved following intensive individual one-on-one sessions equating to the same contact time (Rickheim, Weaver, Flader, & Kendall, 2002). In a recent study evaluating a buddy program designed to provide support for individuals with chronic fatigue syndrome (CFS), post-test results showed that individuals who received a student buddy intervention had significantly greater reductions in fatigue severity and increases in vitality than individuals in the control condition (Jason et al. 2009). In another recent study, both a buddy system and a record-keeping device were shown to be effective in a physical activity intervention (Scott, Cholewa & Irwin, 2008). At this point however, no trial has been identified that incorporates a buddy system and Motivational Interviewing in a physical activity counselling context.

4.6 Self-Management theory

Lorig and Holman (2003) have described three general domains of self-management: namely (1) medical management (including adopting health-promoting behaviours), (2) role management, and (3) emotional management. It is considered that the broad principals of self-management are compatible with the a buddy-motivational interviewing intervention. Performance mastery, modelling, verbal persuasion, role management and

emotional management can potentially be influenced (positively) within the buddy system.

4.7 Cognitive dissonance

Many theories of health behaviour change include the assertion that peoples' motivation for change is grounded in their perception of a dissonance between their actual and their ideal self (Ajzen & Fishbein, 1980; Festinger, 1957; Janz & Becker, 1984; Prochaska & Di Clemente, 1984). Miller (1983) acknowledges the "borrowing" of Festinger's (1957) concept of cognitive dissonance in the early formulation of Motivational Interviewing (later adopting the term discrepancy as a more useful way to describe the gap between the costs of one's present course of behaviour and the perceived advantages of behaviour change).

Festinger's (1957) theory of cognitive dissonance holds that cognitive dissonance manifests as a psychological tension caused by holding two contradictory ideas simultaneously. The theory of cognitive dissonance proposes that people have a motivational drive to reduce dissonance by changing one or more of the following: their attitudes, their beliefs (or justifications), and/or behaviours. Festinger (1957) suggests that in order to minimise this psychological tension, most often, people change their beliefs to fit their actual behaviour, rather than the other way around. Dissonance can lead to bias and the denial of disconfirming evidence.

This discrepancy (dissonance), in its most complex form, has been termed the ‘double approach-avoidance’ conflict in which an individual is ‘trapped’ in a state of cognitive dissonance between two alternatives, each of which have salient positive and negative aspects and implications (Miller & Rollnick, 2002). When an individual shifts toward either alternative, there is a simultaneous shift in the salience of the diametrically opposed negative and positive aspects – and the dissonance is maintained (Miller & Rollnick, 2002). Simply, a goal conflict (or ambivalence) occurs when a person is drawn to a situation (or person) but also repelled from it, both at the same time (Miller, 1983). In the context of Motivational Interviewing, Miller and Rollnick (2002) emphasize that discrepancy (dissonance) has to do with the importance of change– and as Motivational Interviewing is intentionally directive, so the question becomes “how best to present an unpleasant reality so that the person can confront it and be changed by it?” (p.38).

4.8 Motivational Interviewing

Motivational Interviewing (MI) involves a client-centred approach to consultation. The goal of MI is to strengthen the importance of change from the patient's perspective (Burke, Arkowitz, & Menchola, 2003). MI is a directive psychosocial intervention used to identify and resolve discrepancies between desired behaviours and actual behaviours, and to increase motivation for behaviour change (Miller & Rollnick, 2002). **Figure 8** is the writer’s schematic interpretation of Motivational Interviewing and **(Table 3)** summarises common MI terminology and definitions; all drawn

from Miller, Rollnick and others' descriptions (Miller, 1983; Miller & Rollnick, 2002, 2009; Miller & Rose, 2009; Moyers, Martin, Manuel, Miller, & Ernst, 2007; Rollnick, 2008; Rollnick, Miller, & Butler, 2008a). The definition of MI has evolved over time. Previously, MI was defined as follows:

“Motivational interviewing is a directive, client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence” (Miller & Rollnick, 2002, p.25).

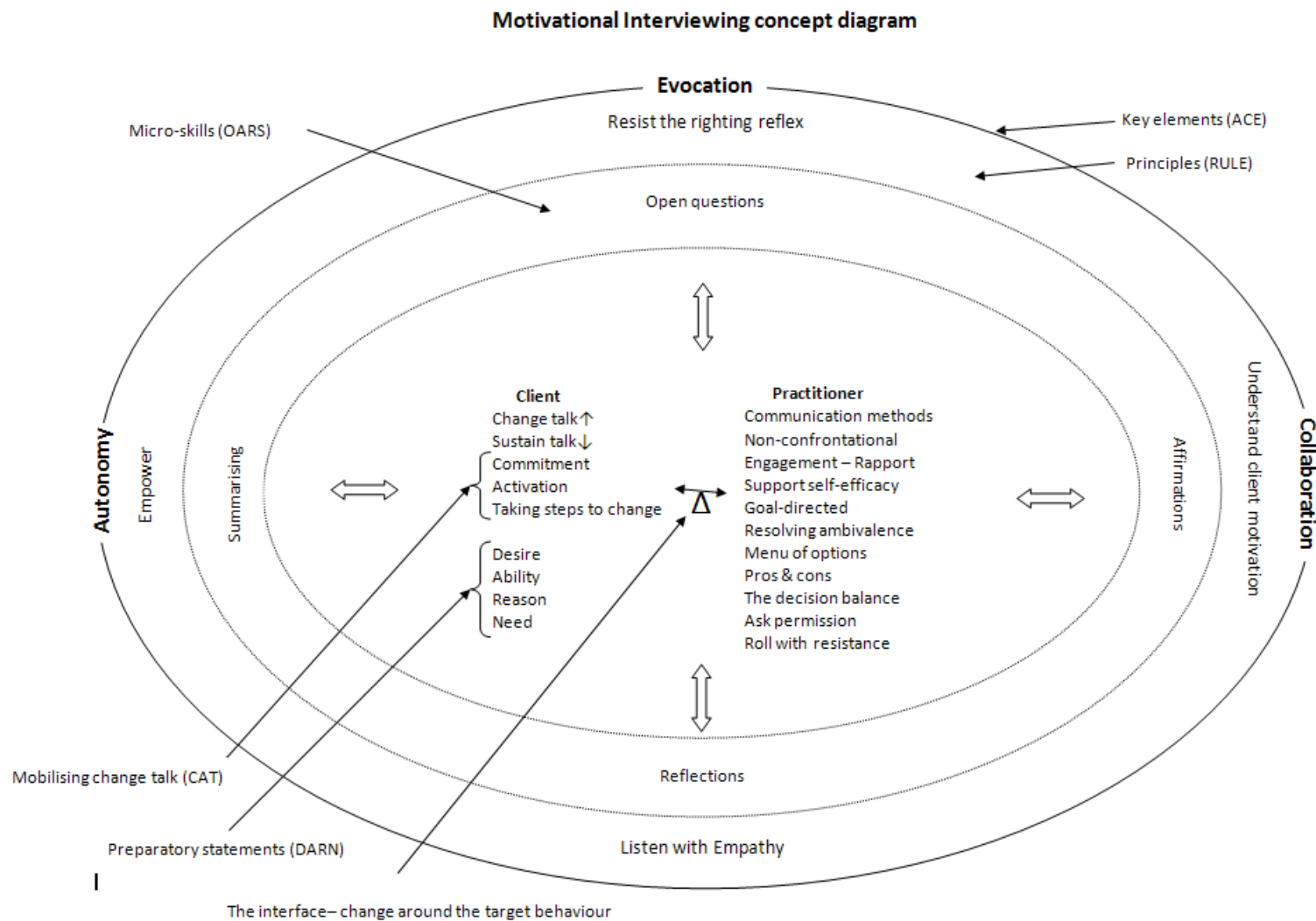


Figure 8: Concepts of Motivational Interviewing

Source concepts from: Miller (1983); Miller and Rollnick (2002); Moyers, Martin et al. (2007); Rollnick (2008); Rollnick, Miller et al. (2008); Miller and Rollnick (2009); Miller and Rose (2009).

This definition expressly identified the examination and resolution of ambivalence as its central purpose, and the style of counselling is defined as intentionally directive. Currently, Miller's (2011) updated definition of Motivational Interviewing no longer includes the explicit focus on the resolution of ambivalence but rather emphasises the strengthening of motivation for change. MI is currently defined as follows:

Motivational Interviewing: "A collaborative goal oriented style of communication with particular attention to the language of change. It is designed to strengthen the individual's motivation for and movement towards a specific goal by eliciting and exploring the person's own reasons for change within an atmosphere of acceptance and compassion" (Miller, 2011).

Underpinning MI is the 'Spirit' and a 'guiding style' and MI includes the principles of collaboration, evocation and honouring client autonomy (Rollnick, et al., 2008a). Collaboration in MI refers to the cooperative partnership between the client and the practitioner, an even power relationship and a joint decision making process (the concept that behaviour change is not the sole responsibility of the client, but is a shared endeavour). Evocation in MI is the process of bringing to mind and harnessing what people already have, and activating their own motivation for change ... based on their own goals and values. Honouring client autonomy in MI describes the required detachment from outcome that allows acceptance of others' freedom of choice (Rollnick, et al., 2008a). Concepts of fundamental importance to MI include therapist empathy,

elicitation of client change talk, a focus on the discrepancy between client behaviours and values, encouraging confidence, and non-confrontational responses to resistance (or ‘sustain talk’) (Moyers, et al., 2007). Previously, the four basic principles central to MI practice and the enhancement of motivation were: (1) expression of empathy, (2) development of discrepancy, (3) rolling with resistance, and (4) the support of self-efficacy (Miller & Rollnick, 2002). However, MI has evolved over time and Rollnick, Miller and Butler (2008) now list the four guiding principles as (1) to resist the righting reflex, (2) to understand and explore the patient’s own motivations, (3) to listen with empathy, and (4) to empower the patient, encouraging hope and optimism (represented by the acronym RULE). In addition, micro-skills including open questions, affirming, reflecting (simple, complex, reframing) and summarising are used (represented by the acronym OARS) along with a range of practical strategies that can be adopted depending of the needs of the client and the context (Miller & Rollnick, 2002). Fundamentally, MI involves the activation of people’s own motivation for change or “eliciting from people that which is already there” (Miller & Rollnick, 2009, p.134). As Miller & Rollnick (2009) state, “If someone genuinely has no inherent motivation for making a change, MI cannot manufacture it” (p.131). Unlike some other talking therapies or clinical interactions, MI involves guiding and directing (including selective reinforcement) rather than confronting but is active not passive. Motivational Interviewing has the potential to facilitate

long-term exercise behaviour change and positively influence peoples' health. MI is not a just a technique and MI is better understood as a clinical or communication method, a complex skill that is learned with considerable practice over time. It is a guiding style for enhancing intrinsic motivation to change (Rollnick et al., 2008).

Table 3: Summary of MI terminology and definitions

Term	Definition
Client-centred/Person-centred	Refers to a fundamental collaborative approach to the client-provider relationship. Client-centred specifically refers to Carl Rogers (1946) reflective listening which is a central skill for a motivational interviewing practitioner. The term person-centred also serves to broaden MI's relevance beyond the clinical setting.
MI Spirit	The spirit of MI encompasses collaboration in all areas of MI practice; eliciting and respecting the client's ideas, perceptions and opinions; eliciting and reinforcing the client's autonomy and choices; and acceptance of the client's decisions.
Ambivalence	Refers to the client's experience of conflicting thoughts and feelings about a particular behaviour or change – advantages and disadvantages.
Directive	Refers to the use of specific strategies and interventions that may facilitate the client's movement in a specific direction (toward problem recognition/change).
Guiding	A flexible blend of informing, asking, listening and reflecting.
Collaboration	Eliciting and conveying respect for the client's ideas, opinions and autonomy. Collaboration is an essential non-authoritarian, supportive and exploratory element of MI.
Evocation	Bringing to mind the ideas, opinions, intrinsic reasons to change, and client confidence that change is possible.
Autonomy-support	Fostering the client's experience of choice and control and respecting the client's decisions.
Change talk	Refers to client statements that indicate an inclination or a reason for change.
Motivational modifiers	Preparatory change-talk: statements of Desire, Ability, Reasons and Need for change (DARN).
Mobilising change-talk	Commitment, Activation and Taking steps to change (CAT). Commitment, is "will, intend to, going to, etc.; Activation includes talk about being willing to change (ready to, willing to but without specific commitment; and Taking Steps to change is reporting recent specific actions (steps) toward change.
Commitment talk	Has been shown to correlate with actual behaviour change.
Sustain talk	Refers to the client's stated reasons not to make a change or to sustain the status quo. Sustain talk is noted to counter change talk, but it is not client' resistance.
Resistance	The client and provider are not moving together toward a mutually agreed upon goal. Client resistance may be a result of a client-practitioner relationship that lacks agreement, collaboration, empathy or client autonomy (may be expressed by arguing, ignoring, interrupting, etc).
Express empathy	Refers to the practitioner making a genuine effort to understand the client's perspective and an equally genuine effort to convey that understanding to the client (an inherent element of reflective listening).
Develop discrepancy	To listen for or employ strategies that facilitate the client's identification of discrepant elements of a particular behaviour or situation. Discrepancy may result in the client's experience of ambivalence.
Roll with resistance	To avoid argumentation, side step or diminish resistance and proceed to connect with the client and move in the same direction.
Support self-efficacy	To support the client's hopefulness that change or improvement is possible.

Table 3: Summary of MI terminology and definitions (continued)

Term	Definition
Open ended questions (OARS)	Open questions elicit fuller responses where closed questions can often be given a yes or no response. Open ended questions facilitate a client's response to questions from his or her own perspective.
Affirmation (OARS)	To actively listen for the client's strengths, values, aspirations and positive qualities and to reflect those to the client in an affirming manner.
Reflective listening (OARS)	Entails a skilful manner of responding to what a client says with more reflective statements than questions. Reflections are always collaborative and non-judgmental. Reflective listening facilitates the client's focus on his or her knowledge and resources.
Summarizing (OARS)	Strategic, collaborative summarising includes directive elements to selectively reinforce or highlight realisations; or identify transitions or progress (affirm); or identify themes.
Elicit Change Talk	Responding to change talk that is offered by the client using strategies that elicit further change talk. For example: 'Evocative open questions'; 'Looking ahead' and 'benefits of change'.
Engagement - Building rapport	The MI practitioner begins by developing trust, building rapport, by following the client with empathic reflective listening. Expressing empathy, respect for autonomy, collaboration, genuineness -MI spirit is essential to the engagement process. The practitioner is careful not to prematurely address topics that may result in client-provider dissonance.
Goal Directed	Refers to identified target behaviours, goals and objectives. The counsellor attains clarity about the target behaviour or goal being addressed and works toward keeping the discussion focused on it. The counsellor will facilitate discussion of the relationship between the client's historic developmental experiences and the client's present goals.
Resolving ambivalence	Facilitating the client's exploration of ambivalence and guiding the client to intrinsic recognition of whether or not the behaviour is a problem and guiding the client towards reaching a decision about change.
Menu of options	Refers to a number of actions that a client and provider collaboratively identify and agree to include in a behaviour change plan. Emphasis is placed upon the client's willingness to pursue an identified action. This menu should be flexible and be directed toward confidence building.
Pros and Cons	Refers to a strategic intervention that facilitates the exploration of the positive and negative experiences a client may have regarding a particular behaviour. Within the new MI definition there is more emphasis on guiding the client to change talk with less emphasis on sustain talk. Miller and Rollnick (2009) now suggest that the 'pros and cons' strategy and 'decisional balance' (see below) may be contraindicated in MI (unless it serves some specific purpose) as these strategies may inadvertently reinforce 'sustain talk'.
The decision balance	A form of identifying pros and cons within four quadrants: (a) What is good about continuing the behaviour; (b) What is not good about changing the behaviour; (c) What is not good about continuing the behaviour; (d) What is good about changing the behaviour. Weight is given to Columns A+B as compared to columns C+D. (see note above regarding usage).
Ask permission	Asking permission to give advice or information, in contrast to giving direct advice. If the client says yes, the practitioner might make recommendations or give specific information or written materials or feedback.

4.8.1 *The Transtheoretical Model and Motivational*

Interviewing

Miller and Rollnick (1991, 2002) acknowledge that the *stages of change* component of the TTM played an important role in the development of

Motivational Interviewing: that it conceptualised change as a process rather than the more traditional *all-or-none* view commonly held by health professionals at the time. Further, the TTM “provided a logical way to think about the clinical role of MI, and MI in turn provided a clear example of how clinicians could help people to move from pre-contemplation and contemplation to preparation and action” (Miller & Rollnick, 2009, p.130). While Miller and Rollnick (2002) have suggested that MI and the TTM are a “natural fit” (2002, p.203), they are clear that MI was never based on the TTM. Rather, Miller and Rollnick (2009) hold the view that the TTM is intended to provide a comprehensive conceptual model of how and why changes occur, whereas MI is a specific clinical method to enhance personal motivation for change. The TTM, as behaviour change model, was deemphasised in some of the authors more recent work (Miller & Rollnick, 2009; Rollnick, Miller, & Butler, 2008b) but the *stages of change concept* at least has since been reintroduced (Miller, 2010).

Further, the constructs of *decisional balance* and *self-efficacy* are integrated within the TTM and these constructs appear to parallel at least two common MI therapeutic strategies: namely *pros-and-cons* and *importance-and-confidence scaling*. The decisional balance construct reflects the individual's relative weighting of the importance of the pros and cons (Velicer, et al., 1998) and the self-efficacy construct is adopted from Bandura's self-efficacy theory (Bandura, 1977) and represents a person's *situation-specific* confidence that he or she can perform a particular

behaviour to effect a desired outcome. A general premise regarding the application of the TTM is that to maximise effectiveness, an intervention should be tailored or *stage-matched* as individuals' *readiness* to change often differs (Prochaska & DiClemente, 1982). In terms of MI as a specific clinical method, this idea of stage-matching can be related to the important therapist attributes of collaboration/partnership, autonomy/support and direction. These global attributes influence practice such that the therapist tries to avoid getting ahead of the client and avoids problem solving *for* the client, in effect staying *matched* with the client's moment-to-moment progression through a change process. For example, it can be argued that there is little point in including a detailed exercise prescription programme if the client had yet to even contemplate the idea of becoming more physically active (pre-contemplation). Whatever the shortcoming of the TTM, as a heuristic model, it may still have something to offer. Certainly the TTM is not incompatible with MI and these ideas may prove to be useful in guiding therapists in their practice.

4.8.2 *Motivational Interviewing summary and conclusions*

MI involves a complex set of skills that if used flexibly, allow the practitioner to respond to moment-to-moment changes in what the client says. MI involves the conscious and disciplined use of specific communication principles and strategies to evoke the person's own motivations for change. Greater emphasis is now given to the underlying 'spirit' of MI and to the importance of 'change talk', and its opposite –

‘sustain talk’ – which is now specifically differentiated from ‘client resistance’, and the importance of ‘commitment talk’. MI is a particular treatment method: “Motivational interviewing is a collaborative, person-centred form of guiding to elicit and strengthen motivation for change” (Miller & Rollnick, (2009, p.137).

4.9 Overall conclusions

Psychological models commonly employed to explain, predict and facilitate health behaviours contain a wide variety of components: some are unique to particular models but many share identical or overlapping characteristics that have evolved from common roots, as a result of an evolutionary process of development (Armitage & Christian, 2003; Noar & Zimmerman, 2005). There is evidence that the effectiveness and efficiency of interventions to promote health behaviour change can be enhanced through better disciplined programme development: guided by health behaviour theories (HBTs) (Taylor, et al., 2006). HBTs should be used to guide intervention design and evaluation, and this should be aimed directly at achieving measurable health outcomes (Armitage & Conner, 2000). Individual level interventions should employ a collaborative, person-centred approach and key aims of such interventions should include supporting people’s self-efficacy and identifying and resolving discrepancies between desired behaviours and actual behaviours, thus increasing motivation for behaviour change. By adhering to sound principals in health promotion programme design, peoples’ motivation for

changing their physical activity behaviour may be enhanced. And, by enhancing social networks, support, knowledge and norms may be transmitted within a community, for better health.

4.10 LITERATURE REVIEW: PART TWO

4.10.1 Introduction: an integrative systematic review of social support interventions

This integrative systematic review is structured to allow for the inclusion of diverse methodologies in order to summarise past empirical and theoretical literature on the inclusion of social support as an intervention element in health behaviour change programmes. More specifically, this review aims to capture the context, processes and subjective elements of proactively involving *buddy-systems*, in health care interventions. The integrative systematic review method contributes to the presentation of varied perspectives on a phenomenon of concern and has been advocated as important to interventionists in the health sciences (Conn & Rantz, 2003; Whittemore & Knafl, 2005). However, the complexity inherent in combining diverse methodologies can potentially contribute to lack of rigour, inaccuracy, and bias (An, et al., 2006). In an effort to avoid these pitfalls, this review draws on and aligns with (to the extent possible) existing methods of study selection, appraisal, analysis, synthesis, and conclusion-drawing as used in *standard* systematic reviews, and advocated by the Australian National Health and Medical Research Council (NHMRC, 1999b, 2008a) and the Cochrane Collaboration (Mulrow & Oxman, 1997). In particular, the inclusion of a rigorous and transparent search strategy, documentation and presentation of the use of *a priori* inclusion criteria, the critical appraisal of included studies, the use of

standardised data extraction tables and the use of standard narrative synthesis and summary techniques.

4.10.1.1 *Review purpose*

The purpose of this integrative systematic review is to provide a structured summary of the evidence relating to the effectiveness of behaviour-change interventions that specifically involve social support or buddy-systems. The report is structured to progress from the *general* to the *specific* rather than progressing strictly by *levels/strength of evidence* as is perhaps more usual in a one-indication-one-intervention type of systematic review. Beginning with the broad view, this review aims to report the evidence for social support interventions in health care generally. Then, more specifically, this review aims to report the evidence for interventions that employ *buddy-systems*. Buddy-system interventions can be further divided into two broad types: directed support interventions, that use populations who identify a potential willing buddy before randomisation (and therefore make use of pre-existing support structures and/or attempt to improve the quality of support with training) or they may fall into the second category of the 'initiation of new ties' (paring participants up within a programme or group).

While the basic research question is necessarily broad, the scope *has* been limited somewhat to evaluations of the following health behaviours: smoking cessation, physical activity, nutritional management/weight loss (food intake), diabetes self-management and alcohol use/abstinence. This

inclusive approach has been taken because (a) the number of studies conducted in any one health behaviour change domain is still small (b) generally there are many *commonalities* to changing health behaviours across domains and (c) there may be notable *differences* that are specific to certain domains and these differences might provide valuable information and contrast.

4.10.1.2 *Description of health problem*

Unhealthy behaviours increase morbidity and mortality and are highly prevalent in developed and developing countries. Unhealthy behaviours are risk factors for diseases such as overweight and obesity, Type-2 diabetes, cardiovascular disease and some cancers. High blood pressure, high cholesterol levels, tobacco use, low fruit and vegetable intake, high body mass index, and physical inactivity are all modifiable risk factors for a number of chronic diseases and are related to a significant proportion of the global burden of disease (Rodgers, et al., 2004).

Higher levels of social support have generally been found to be associated with beneficial changes in risk factors for many diseases (Achterberg, et al., 2011; Fiore, Bailey, & Cohen, 2000). Increasing physical activity levels for example helps prevent diseases such as cardiovascular disease and diabetes (Gonder-Frederick, et al., 2002) and results in improved cardiovascular health (Morris, 1994), lowered blood pressure, reduced risk of mortality, increased muscle strength, decreased depression and anxiety and improved quality of life (Bouchard & Shephard, 1994). Smoking is another important

example and arguably the most important single risk factor for mortality, and smoking has been related to 12% of the burden of disease in Western Europe (Feenstra, Van Baal, Hoogenveen, Vijgen, & Bemelmans, 2006) and, at least in theory, is totally modifiable.

All of the above illustrate how behaviours are relevant to health. Yet unhealthy habits are highly prevalent and these unhealthy behaviours are generally very resistant to change. Implementing interventions that increase social support may be important to achieving beneficial changes in risk factors for individuals and also their significant others.

4.10.1.3 *Description of intervention*

Viewed from the broadest perspective, any health behaviour change intervention that in some way seeks to *modify* the level of social support that participants receive during and/or after an intervention programme can be said to have a social support component. Studies of these intervention types are different from studies that only measure and/or adjust for existing levels of social support in a *correlational* sense.

Social support is a general classification that encompasses at least three distinct types of support: perceived support (counting on family/friends to provide assistance during times of trouble), enacted support (specific supportive actions/doing things together) and social integration (the range of different types of social relations) (Barrera, 1986). The interventions included here may target one or more of these distinct types. Others make

the distinction between two types only, specifically structural and functional support. Structural support being the *availability* of significant others, irrespective of the actual exchange of support and functional support being a subjective measure of the perception of support, depending on individualised characteristics and expectations (Cohen, 1992). While it would appear that there is a strong argument for designing interventions to increase functional support (changing people's perception of support), the reality is that changing people's levels of structural support by adding health professionals or peers seems more feasible (Verheijden, Bakx, Weel, Koelen, & Staveren, 2005). It has been suggested that social support from health professionals may have a limited effect in comparison to support from patients' natural support networks (due to the nonreciprocal relationship between patients and health professionals). For this reason, studies of health professional or paid 'volunteer' supporters have been excluded from this review.

4.10.1.4 *The issue*

Unfortunately, the cross-sectional nature of much of the research relating social support to health does not allow for causal inferences. It is known that a strong association can certainly be demonstrated between social support and health. Adding social support to lifestyle intervention programs has the potential to reduce workload for health professionals, and is appreciated by at least part of the patient population, however the evidence to date is sometimes conflicting. We need to know more about why, how,

and for whom the many characteristics of social support are beneficial, and how these apparent beneficial effects might be fully realised in interventions aimed at long term health behaviour change (Verheijden, et al., 2005). In addition, there is also the potential that such social support lifestyle-intervention programs can not only lead to improved health for the patient but also for the support giver. This potentially important effect is referred to as the 'helper therapy principle' (Riessman, 1965). Research has demonstrated that helping others can improve self-concept and improve physical health. Again, more research is needed to provide guidance to intervention designers about the *why* and *for whom*, questions, and about *how* exactly to implement programmes that offer the best opportunities for participants and their support person(s) and families to improve their health together.

4.10.1.5 *Structure of this report/section*

This review summarises evidence relating to the effectiveness of a range of individual level and group interventions aimed at modifying specific attributes of people's social networks, with the clear objective of influencing favourable behavioural and/or physiological and/or health-related quality of life outcomes. The next section describes the review's methods and includes the research questions, search strategy, inclusion and exclusion criteria, and the data extraction, appraisal and synthesis methods. The results section considers the included appraised studies, reporting first on the systematic reviews and meta-analyses, and then on the identified

primary research studies. Study characteristics and findings are reported in separate tables and synthesised in the text. The final section overviews and summarises results, briefly discusses key findings, limitations and identified gaps in knowledge.

4.10.2 Systematic review methods

The review methodology used in this section is broadly based upon guidelines published by the Australian National Health and Medical Research Council (NHMRC, 2000a, 2000b, 2008b).

4.10.2.1 Research questions

In general, the aim of part-two of this literature review 'the review' was to evaluate the effectiveness of social support interventions for modifying individual's health-related behaviours and related health outcomes. The primary research question addressed by this review is:

For all individuals with at least some scope to improve their health promoting behaviours and related health outcomes; what is the effectiveness of individual level interventions that aim to modify specific attributes of participant's social networks, with the clear objective of influencing favourable behavioural and/or physiological and/or health-related quality of life outcomes, compared to usual care individual level interventions that do not by design enlist significant others in a social support role?

Studies that compared the effect of interventions modifying at least one level of social support, on individual behaviour and related health outcomes were considered for possible inclusion in the review. Broadly, the outcomes of interest can be summarised as decreasing behaviours associated with

contracting a disease or increasing the use of screening practices and other healthy lifestyle choices. The review question was defined according to the population, intervention, comparator and outcomes (PICO) criteria as detailed in **Table 4**, the type(s) of studies as detailed in **Table 6** and the exclusion criteria as detailed in **Table 7**. These criteria were developed *a priori*. In addition, studies were required to be reports of primary investigations or interventions that had been selected previously for evaluation in systematic reviews (rather than, for example, practice guidelines or narrative reviews) and to compare outcomes among groups of persons exposed to the intervention with outcomes among groups of persons not exposed or less exposed to the intervention, whether the study design included a concurrent or before-and-after comparison. Further, studies needed to have specified predefined outcomes of interest including the demonstration of improvements in physical activity behaviour outcomes (e.g., increased time spent walking) or increases in selected fitness measures (e.g., increased aerobic capacity) or other health outcomes as appropriate to other health behaviour change domains (such as diet, smoking cessation, diabetes self-management).

Table 4: PICO Criteria for determining study eligibility

PICO	
Participants/ population	Adults and adolescents from populations from countries whose health systems, population distributions, and quality of care are comparable to that of New Zealand. Such population groups include, but are not limited to potential participants in screening programmes and Physically inactive adults Patients with heart disease Adults with asthma Obese sedentary adults/adults in a dietary intervention Adults with diabetes Adults in workplace wellness programmes Adults in the a substance abuse intervention Smokers
Intervention	Broadly, Interventions aimed at building, strengthening, and maintaining social networks that provide supportive relationships for health-related behaviour change. This can include either creating new social networks or working within pre-existing networks in a specific social setting, and with the clear objective of influencing favourable behavioural and/or physiological and/or health-related quality of life outcomes. Examples include: setting up a buddy system, formally involving significant others in a defined support role, contracting with another person to complete specified levels of physical activity, or establishing walking groups or other groups to provide friendship and support. Behavioural and social approaches including school-based or tertiary institution settings, primary health-care settings and hospital settings, and other social spheres (e.g. church, clubs, antenatal groups, and other community settings). Interventions that formally engage and utilise the influence of important others, family, class leaders, co-exercisers, social cohesion, and task cohesion. Interventions that are clear in the content offered (what was targeted e.g. knowledge, attitude, social support) and how (e.g. buddy system, significant others).
Comparator	Standard Treatment or conventional intervention. The interventions should be compared with 'no-intervention' or standard care (i.e. the usual level of care that would normally be provided or undertaken within the setting in the absence of an intervention aimed at increasing social support for the purpose of improving some specific health-related patient/client/participant level outcome.
Outcomes	Behaviour (adherence/abstinence/compliance) [clinical tests, fitness tests, biochemical tests) Affect (satisfaction and attitude) Health-related Quality of Life Other relevant behavioural or health-status measures

The levels of evidence (NHMRC levels for intervention studies) are specified in **Table 5** and the types of studies considered as eligible for this review are detailed in **Table 6**. These criteria define the nature of the evidence in terms of publication type, and individual study design, duration (of follow-up) and sample size.

Table 5: NHMRC additional levels of evidence and grades for intervention studies

Level	Intervention studies ¹	NHMRC (2008)
I ²	A systematic review of level I studies.	
II	A randomised controlled trial.	
III-1	A pseudo-randomised controlled trial (ie alternate allocation or some other method).	
III-2	A comparative study with concurrent controls: <ul style="list-style-type: none"> ▪ non-randomised, experimental trial³ ▪ cohort study ▪ case-control study ▪ Interrupted time series with a control group. 	
III-3	A comparative study without concurrent controls: <ul style="list-style-type: none"> ▪ historical control study ▪ two or more single arm study⁴ ▪ Interrupted time series without a parallel control group 	
IV	Case series with either post-test or pre-test/post-test outcomes	

Explanatory notes:

1 Definitions of these study designs are provided on pages 7-8 How to use the evidence: assessment and application of scientific evidence (NHMRC 2000b) and in the accompanying Glossary.

2 A systematic review will only be assigned a level of evidence as high as the studies it contains, excepting where those studies are of level II evidence. Systematic reviews of level II evidence provide more data than the individual studies, and any meta-analyses will increase the precision of the overall results, reducing the likelihood that the results are affected by chance. Systematic reviews of lower-level evidence present results of likely poor internal validity and thus are rated on the likelihood that the results have been affected by bias, rather than whether the systematic review itself is of good quality. Systematic review quality should be assessed separately. A systematic review should consist of at least two studies. In systematic reviews that include different study designs, the overall level of evidence should relate to each individual outcome/result, as different studies (and study designs) might contribute to each different outcome.

3 This also includes controlled 'before & after' (pre-test/post-test) studies, as well as adjusted indirect comparisons (ie utilise A vs. B and B vs. C, to determine A vs. C with statistical adjustment for B).

4 Comparing single arm studies (ie case series from two studies). This would also include unadjusted indirect comparisons (ie utilise A vs. B and B vs. C to determine A vs. C, but where there is no statistical adjustment for B).

Source: Hierarchies adapted and modified from: NHMRC (2008b); NHMRC (1999a); Bandalier (1999); Lamer et al. (1999); Phillips et al. (2001).

Table 6: Nature of the evidence

Dimension	
Publication type	Studies published in the English-language, including primary (original) research published as full original reports and secondary research (systematic reviews and meta-analyses) appearing in the published literature.
Study design	Those that provide at least Level III-3 evidence according to the NHMRC interim levels of evidence for intervention research questions (2008) (Table 5). This includes randomised controlled trials (RCTs) (Level II evidence) of crossover or parallel-group design, and systematic reviews of Level II evidence, pseudo-randomised controlled trials (Level III-1 evidence), non-randomised, experimental trials, cohort studies, case-control studies, interrupted time series (ITS) with a control group (Level III-2 evidence).
Study duration	No study duration specified.
Sample size	At least 20 evaluable participants per study arm (or exposed to both treatments). This includes 20 participants per arm in intervention studies or 10 participants in crossover trials.

4.10.2.2 *Literature search*

A systematic method of literature searching and selection was employed in the preparation of this review. Searches were limited to English-language material published from 1990 onwards. The searches were completed on 31th, August, 2012. Therefore, studies published after this date were not eligible for inclusion in the review.

4.10.2.3 *Bibliographic databases*

- EMBASE
- MEDLINE
- PsycINFO
- CINAHL
- SPORTDiscus
- Social sci search

4.10.2.4 *Review databases*

- Cochrane Database of Systematic Reviews
- Cochrane Central Register of Controlled Trials
- Database of Abstracts of Reviews of Effectiveness
- Health Technology Assessment (HTA) database

The reference lists of included papers were scanned to identify any peer reviewed evidence that may have been missed in the literature search. Manual searching of journals or contacting of authors for unpublished research was not undertaken. Grey literature and unpublished material such as conference abstracts were not included in the evidence review; however they may be referred to in background sections.

Search terms were used as keywords, expanded where possible, and as free text within the title and/or abstract, in the EMBASE and MEDLINE databases. Variations on these terms were used for the Cochrane Library and other databases, and if required, modified to suit their keywords and descriptors. The search terms, search strategy, and citations identified are presented in **Appendix E**.

4.10.2.5 *Assessment of study eligibility*

Broadly, studies were selected for appraisal using a two-stage process. First, titles and abstracts (where available) identified from the search strategy were scanned and excluded as appropriate. Second, the full-text articles were retrieved for the remaining studies and selected for inclusion and appraisal in the review if they fulfilled the study selection criteria outlined below (**Table 7**). The application of these criteria is detailed in **Figure 9**. Citation management was achieved using ENDNOTEx6 TM (Thomson Reuters, 1988-2012 ©) with user-defined custom fields to tag all citations with one of 11 codes over the two appraisal passes (title/abstract and full-text). Internal searches were used to generate the included study

list and also to cross-check that every citation in the data-base was accounted for.

Table 7: Exclusion criteria

Exclusion Code	Reason
E1 Study design	Including non-systematic/narrative reviews, exploratory studies with no appropriate comparison groups, case reports, letters, editorials, conference abstracts, and studies not deemed appropriate to the research question.
E2 Population	Populations belonging to health care systems that do not closely match New Zealand's or another developed country's health care systems in terms of organisational aspects and quality of care. Children. Studies in mental health or the criminal justice system.
E3 Intervention	<p>Incorrect intervention or no intervention or wrong exposure variables.</p> <p>-Studies that failed to compare the effect of at least one level of social support on individual behaviour and/or health outcome.</p> <p>-Interventions oriented toward health-care providers or structured exercise classes as part of multi-component community-based interventions: where the effect of the buddy-system or similar social component could not be isolated from other generalised effects.</p> <p>-Informational approaches including nation-wide/community-wide information/educational campaigns and point-of-decision prompts (e.g. to encourage using stairs or other features in the built environment).</p> <p>-Environmental and policy approaches (e.g. creation of or enhanced access to places for physical activity, cycle-ways, and/or informational outreach activities).</p> <p>-Mass media campaigns.</p> <p>-Studies providing only vague descriptions of intervention components (such as "health promotion programme").</p>
E4 Comparator	Does not include the correct comparator/s. Specifically, (1) studies that do not compare time periods (pre-interventions and post interventions) within the same population, (2) comparison groups not sampled on the same exposure or interventions/ situations (e.g., those who have received a specific intervention) versus those who have not, (3) comparison groups not sampled on relevant outcomes, (4) ecological studies with demographic or other non-modifiable system level variables that cannot be compared or extrapolated to individual levels.
E5 Outcomes	<p>Inappropriate outcomes: outcomes that are not related to behaviour or health-related quality of life.</p> <p>Studies that failed to compare the effect of at least one level of social support on individual behaviour, cognitions, affect, health related quality of life or other health status outcomes.</p>
E6	Non-English language
E7	Fewer than 20 patients/subjects
E8	Published or data pre-1990
E9	Full-text not available from any source
E10	Other or retrieved for background only

Note: Articles were excluded if they repeated what was already reported in another publication, or if an article had been superseded by more recent work. Therefore, general 'non-systematic' review articles or overviews were not included. Other excluded but cited publications (e.g. those providing background materials) are presented in References.

4.10.3 Appraisal of included studies

4.10.3.1 Dimensions of evidence

The aim of this review was to find the highest quality evidence to answer the clinical question, in accordance with NHMRC guidance and the dimensions of level, quality, precision, size of effect and relevance were all considered. For systematic reviews, RCTs, and other non-randomised observational study designs, NHMRC quality checklists (1999a) were employed to appraise the included articles. The characteristics and quality of each included study were assessed using a number of standardised quality questions.

4.10.3.2 Data extraction

Data were extracted onto specifically-designed data extraction forms, and included information regarding study design, participant characteristics, and details of the intervention, relevant outcomes, study quality, and relevant results. Unless otherwise specified, the data that were most adjusted for confounders and/or multiple comparisons are reported. Where subgroup analyses are available, these were reported if they are deemed relevant. Completed data extraction tables containing detailed information regarding study characteristics, quality and results can be found in **Appendix E**.

4.10.3.3 Data synthesis

In addition to the level and quality of evidence of individual studies, the review will consider the body of evidence in total. This will involve

consideration of the volume of evidence and its consistency. This review presents the statistical precision of the estimated effect size, together with a discussion of its clinical significance, to the extent that this information is reported. Finally, the review considers the relevance of the evidence, both with regard to the applicability of the population and the intervention, as well as the relevance to the New Zealand health care setting. A finding of insufficient evidence of effectiveness should not be regarded as evidence of ineffectiveness.

4.10.3.4 *Limitations of the review methodology*

This review used a structured approach to review the literature. However, there were some inherent limitations to this approach. Reporting biases are a particular problem related to systematic reviews and include publication bias (file drawer effect), time-lag bias, multiple publication bias, language bias, and outcome reporting bias (Egger, Dickersin, & Davey Smith, 2001). Some of these biases are potentially present in this review. Only data published in peer reviewed journals are included and no attempt was made to include unpublished material. Data extraction, critical appraisal and report preparation was performed by only one reviewer (DB). Due to the broad scope of phrases and key words that are used to describe social support and buddy systems generally, it is possible that published research inclusive of these phenomena may have been missed during the implementation of the search strategy. It is also probable that other research that met the inclusion criteria may be available in languages other than

English or is available through other non-published database sources. The flow of identified studies through the eligibility and appraisal process is shown in **Figure 9**.

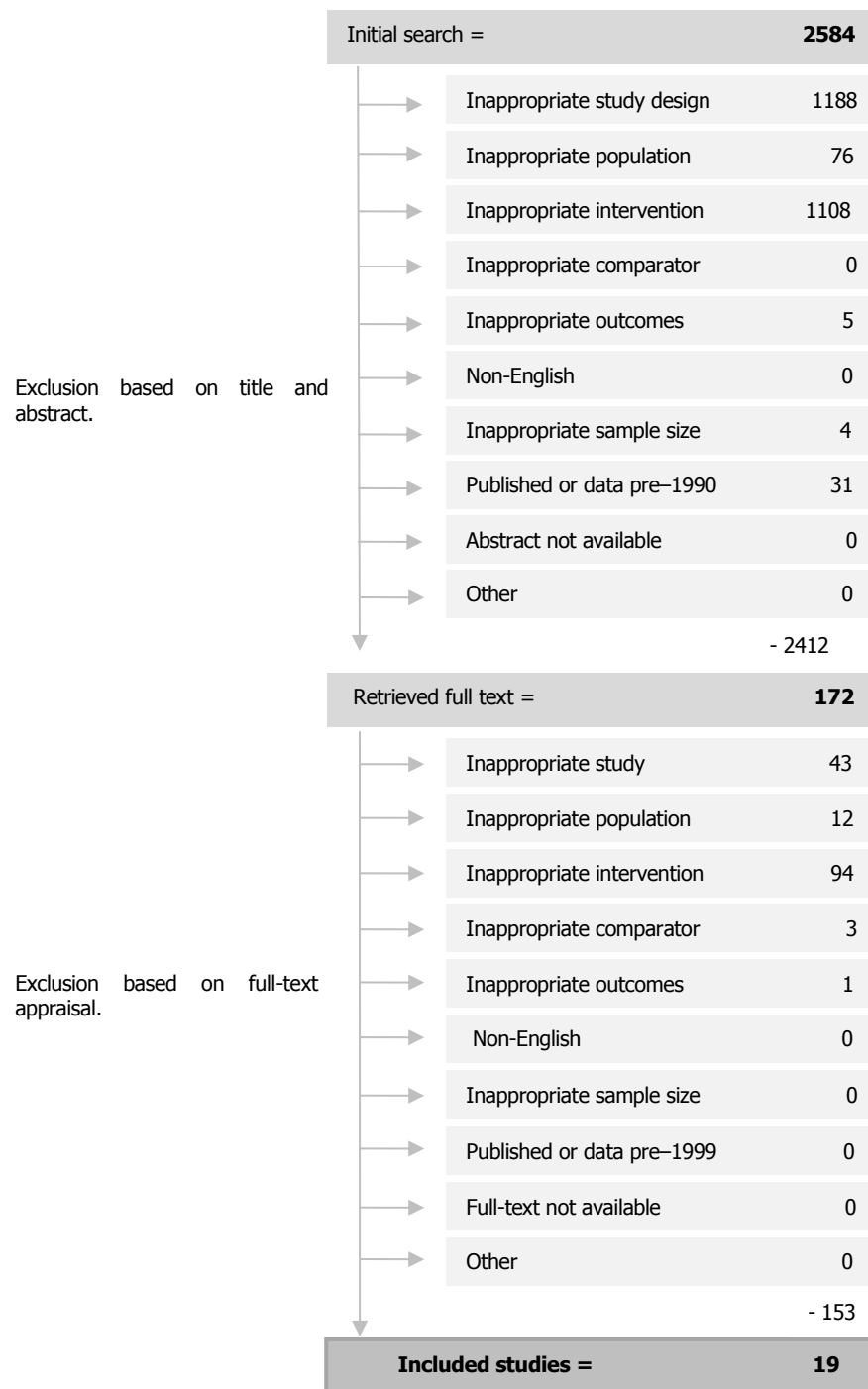


Figure 9: Flow of identified studies through the eligibility and appraisal process

There were 2584 non-duplicate studies identified by the search strategy; 172 full text articles were eligible for retrieval after excluding studies from the search based on titles and abstracts. Of full papers retrieved, 153 did not fulfil the inclusion criteria. Therefore, 19 articles were fully appraised and are included in this report.

4.10.4 Literature review results

4.10.4.1 Study characteristics: overview

Of the 19 papers identified as eligible, five were systematic reviews, and fourteen were original primary research studies. The five review articles are reported first, commencing on page 93, and the original research articles follow, commencing on page 113. The 14 original studies differed with respect to study design. Study designs included three cluster randomised controlled trials (C-RCTs) and nine randomised controlled trials (RCTs), all were evidence level II. The remaining two studies were of other designs: one was a non-randomised controlled clinical trial (evidence level III-2); and the other was controlled before and after trial (comparing outcomes of the same group before and after the implementation of the intervention or 'within group analysis': evidence level III-3).

Overall, the methodological quality of the original research studies was fair-good. Some studies provided data on withdrawals and drop-outs, but not all. In general, studies provided adequate information on their analyses and reported on the intention to treat analysis (some also reported per-protocol). Due to the nature of the interventions and the challenges of conducting (pragmatic) randomised trials in clinic settings, the majority of the studies were not blinded. Many of the studies used subjective measures for assessing outcomes, most commonly, patient interviews although studies generally used objective measures when practical. Tools for measuring the primary outcomes were usually described adequately.

4.10.5 Population

Populations studied included both healthy people and people with established disease. This included people from countries whose health systems, population distributions, and quality of care are comparable to that of New Zealand.

4.10.5.1 Interventions

The original papers and systematic reviews collectively evaluated the effectiveness of a range of health behaviour change programmes as delivered in various primary care and community settings and these interventions all included a component aimed at influencing social support or directly involving a support person in the change process. The support persons or the 'agents' of social support were variously described, including family, marriage partners, spouse, partner, sexual partner, buddy, friend, co-habitees, co-worker, important others, significant others and co-participants.

4.10.5.2 Comparisons

In the main, the interventions were compared with 'usual care', and this was usually well described. Here, 'usual care' is defined as the usual level of care that would normally be provided or undertaken within the particular setting, in the absence of an intervention aimed specifically at increasing social support or engaging a motivational-buddy or otherwise nominated support person.

4.10.5.3 *Outcomes*

The identified studies often measured a range of outcomes, using various instruments and methods (e.g. self-report, observed, biochemical). Broadly, the outcomes were the performance of the particular behaviour (change) of interest, depending on the context. In the main, this was essentially the *adherence* to some behavioural regime or programme (behaviour that is self-selected and initiated) or *compliance* to some recommended course of action (behaviour that is required or prescribed by others, such as a health professional).

4.10.5.4 *Results presentation*

Information and results extracted from the included studies follow, first for systematic reviews, then for the original research studies. The original research studies are grouped and presented by indication (starting with smoking being the most common) and by level of evidence and publication date order. More detailed information is available in the data extraction tables in **Appendix E**, or alternatively, the reader should refer to the authors' original paper.

4.11 Systematic reviews: introduction

The literature search identified five relevant systematic reviews and these are first briefly summarised in **Table 8**. The reviews differed considerably with respect to their inclusion criteria and in particular the different types of study designs included for review, the publication year range, and the process and/or patient outcomes reported. The reviews are therefore presented in this section starting with the 'general' and moving down to the 'specific'. For this review section, more generalised criteria have been applied, as to exclude these reports would unnecessarily exclude valuable information that could be used to inform the design and implementation of buddy interventions generally and buddy-Motivational Interviewing interventions in particular. Further, much of the information included in the reviews could potentially be applied across a range of different indication/intervention combinations. The five reviews are organised below in the following order: evidence for socially oriented behaviour change techniques in general (Achterberg, et al., 2011)⇒ interventions for physical activity (two reviews) (Conn, Hafdahl, & Mehr, 2011; Heath, et al., 2012) ⇒ enhancing partner support (smoking cessation) (Park, Tudiver, & Campbell, 2012) ⇒ buddy-systems (smoking cessation) (May & West, 2000).

4.12 Systematic reviews: results

The results of the five systematic reviews are first briefly summarised in **Table 8**. Given the necessity to focus on the specific review question, only the data most relevant to the current question are presented in the brief results tables. The broader context and implications are then discussed further in the paragraphs below.

Table 8: Systematic review results for the effectiveness of behaviour change interventions involving social support

Achtenberg (2011)	"How to promote healthy behaviours in patients? An overview of evidence for behaviour change techniques."	Evidence level = I Quality = Good
Brief description: To identify the evidence for the effectiveness of behaviour change techniques, when used by health-care professionals, in accomplishing health-promoting behaviours in patients as described in systematic reviews. Systematic review of 23 systematic reviews which included 210 studies and 88% of the studies included in the reviews were RCTs		
Outcomes	Intervention	Results summary
Smoking behaviour, physical exercise or food intake	Plan social support or social change (social support theories): Prompting consideration of how others could change their behaviour to offer the person help or (instrumental) social support, including "buddy" systems and/or providing social support.	All studies of the intervention type "social influence" [% studies with sign + effects (n)] Smoking 33 (9); Exercise 100 (1); Diet 67 (3); all health behaviours 53 (13).
<p>Summary paragraph</p> <p>The numbers of studies with significantly positive results were highest for the awareness directed techniques self-monitoring of behaviour (56%) and risk communication (52%) whereas the intention directed strategy use of social support (50%) was almost as successful.</p> <p>Another finding is that the evidence from smoking cessation research largely differs from the evidence for the other two health topics. Some techniques were (almost) only studied in smoking cessation research (re-evaluation of outcomes, persuasive communication, reinforcement on behavioural progress, planning coping responses, use of social support).</p>		

Table 8: Systematic review results for the effectiveness of behaviour change interventions involving social support (*continued*)

Heath (2012)	"Evidence-based intervention in physical activity: lessons from around the world."	Evidence level = I Quality = Good
Brief description: To review previous reviews of physical activity interventions, published between 2000 and 2011 (n=100), and identify effective, promising, or emerging interventions.		
Outcomes	Intervention	Results summary
Any measure for physical activity outcome	(1) Campaigns and informational approaches, (2) behavioural/social approaches, (3) environmental and policy approaches	Mean effect-size estimates: Healthy adults d=0.19 Physical activity counselling d=0.16 Behavioural interventions d= 0.32
<p>Summary paragraph</p> <p>Social support in community settings is an example of a strategy that capitalises on social networks to reinforce physical activity behaviour. Behavioural and social approaches include creation of buddy systems, behavioural contracts between the participant and programme leaders, and formation of walking or other physical activity support groups. Initiatives to increase social support for physical activity within communities, specific neighbourhoods, and worksites can effectively promote physical activity.</p>		
Conn (2011)	"Interventions to Increase Physical Activity Among Healthy Adults: Meta-Analysis of Outcomes." (358 trials).	Evidence level = I Quality = Good
Brief description: A meta-analysis summarising the effects of interventions designed to increase physical activity among healthy adults: (1) What overall effects do interventions designed to increase physical activity have on physical activity behaviour after completion of interventions? (2) Do interventions' effects on physical activity behaviour vary depending on intervention, methodology, or sample characteristics?		
Outcomes	Intervention	Results summary
Ambulatory steps per day and minutes per week.	Diverse physical activity behaviour change interventions	A randomly selected study's true mean difference for treatment participants could plausibly range from 11 minutes per week less to about 40 minutes per week more. The characteristics of the most effective interventions were behavioural interventions instead of cognitive interventions, face-to-face delivery versus mediated interventions (e.g., via telephone or mail), and targeting individuals. Interventions that exclusively used behavioural strategies (0.25) (e.g., goal setting, contracting, self-monitoring, cues, rewards NOT cognitive e.g. decision making, health education, providing information)....a robust finding. Control participants did not experience increased physical activity by participating in studies, as evidenced by a mean effect size of d=0.00
<p>Summary paragraph</p> <p>These findings suggest that interventions to increase physical activity should emphasize behavioural components such as self-monitoring, stimuli to increase physical activity, rewards, behavioural goal setting, and modelling physical activity behaviour in standardized interventions delivered to individuals face-to-face.</p>		

Table 8: Systematic review results for the effectiveness of behaviour change interventions involving social support (*continued*)

Park (2012)	Cochrane Review: Enhancing partner support to improve smoking cessation	Evidence level = I Quality = Good
Brief description: To determine if an intervention to enhance partner support helps smoking cessation when added as an adjunct to a smoking cessation programme.		
Outcomes	Intervention	Results summary
-Self-reported abstinence of the smoker or biochemical assessment assessed at least six months following the initiation of treatment. -Level of partner support, as assessed by the PIQ.	Interventions designed to enhance partner support for smokers in cessation programmes including spouses, friends, co-workers, 'buddies', or other significant others who supported the smokers as a part of the cessation programme to which they were assigned.	11 included studies a total of 2172 participants. There was no evidence of an effect at either follow-up point: at six to nine months the RR was 0.99 (95% CI 0.84 to 1.15) and at 12 months or greater the RR was 1.04 (95% CI 0.87 to 1.24).
<p>Summary paragraph</p> <p>Although support from a spouse has been shown to be highly predictive of successful smoking cessation the literature in this area is somewhat confusing. Interventions should pay more attention to the quality of the partner interaction and be more effective at increasing partner support. These studies suggest that partner support and the absence of partner criticism may be important in smoking cessation, but that these behaviours are not easily changed by the interventions used in these studies.</p>		
May (2000)	Do social support interventions ("buddy systems") aid smoking cessation? A review.	Evidence level = I Quality = Good
Brief description: To provide an overview of the role of social support in smoking cessation and to critically review evidence regarding the use of "buddy systems". Narrative synthesis.		
Outcomes	Intervention	Results summary
Point prevalence rate of smoking abstinence	Use of a social support intervention, including a "buddy" (either using buddies from among smokers' existing relationships (nine studies) or from within groups (one study).	In the time period that this review was conducted, most research in the area did not use a randomised design. In most cases researchers were attempting to influence pre-existing supportive relationships, often with a spouse. Interventions involving new ties ("common adversity") and interventions using existing ones can both offer the "buddies" various levels of training. However, the latter involve attempting to develop or change an established relationship. Other behavioural research suggests that these relationships can be very resistant to change.
<p>Summary paragraph</p> <p>There is a lack of evidence regarding the efficacy of the use of buddies in community interventions. The difficulty of translating the benefits of natural resources to effective interventions is not unique to this field. The finding that many people engaged a buddy when prompted to suggests the practicality of simple social support manipulations if they can be shown to be effective. Studies have generally found that having such a buddy is positively correlated with success in stopping smoking. In some circumstances participants who engaged a buddy were three times more likely to quit. However, the finding is not universal.</p>		

Achtenberg et al. (2011) conducted a 'review of reviews' to investigate the effectiveness of behaviour change techniques when used by health-care professionals, in accomplishing health-promoting behaviours in patients

generally. They conducted a comprehensive search of Pubmed, CINAHL, PsycInfo and the Cochrane Database of Systematic Reviews and they applied rigorous methods to establish the eligibility of reviews. Achterberg et al. (2011) conducted detailed quality assessment and appraisal of 23 systematic reviews (1998-2008) which included 210 studies across the domains of *smoking* (n=14), *diet* (n=1), *exercise* (n=6) and diet and exercise combined (n=2). Overall, 88% of the studies included in the reviews were RCTs. The types of participants/patients were defined as all who were diagnosed with physical or mental diseases and/or who were recruited through contacts with healthcare providers. The taxonomy of behavioural change techniques described by Abraham and Michie, (2008) was used to relate descriptions of intervention content to definitions of behaviour change techniques. All interventions were considered if the *content* was reported in sufficient detail, if exactly *what* was targeted was clear (e.g. knowledge, attitude, social support, facilities, etc.) and if the intended *mechanism of action* was also specified (for instance through education, feedback, peer influence financial rewards). The health related outcomes of interest were behavioural outcome assessments (such as smoking behaviour, physical exercise or food intake) at any length of follow-up. A descriptive analysis was employed to report the frequency of use of behaviour change techniques and the information on effectiveness.

Achterberg et al. (2011) found that the numbers of studies with significantly positive results were highest for the awareness directed

techniques self-monitoring of behaviour (56%) and risk communication (52%) and the intention directed strategy use of social support was almost as successful (50%). Relatively high percentages of successful studies were also found for the attitude technique reinforcement on behavioural progress (46%), the self-efficacy technique of planning coping responses (45%) and the intention technique specific goal setting (42%). Another finding is that the evidence from smoking cessation research largely differs from the evidence for the other two health topics. Some techniques were (almost) only studied in smoking cessation research (re-evaluation of outcomes, persuasive communication, reinforcement on behavioural progress, planning coping responses, use of social support). With other techniques results were different and often more positive in studies on exercise and diet.

The authors concluded that self-monitoring of behaviour, risk communication, and use of social support were most often identified as effective. The frequently used knowledge and facilitation techniques were clearly less often effective. This comprehensive review of reviews reports data relating to the broad view of the effectiveness of behaviour change techniques across smoking, diet and exercise. This comprehensive review is relevant to inform the design of intervention components directed specifically at patients as well as interventions components such as training strategies that might be directed at supporters (helpful when trying to enhance social support and buddy-relationships). For example, the

information presented here suggests that if knowledge (only) techniques are not particularly effective with patients then it is likely that they may not be particularly effective with buddies either, and that multi-component designs are generally more effective than single component interventions.

Heath and Parra et al. (2012) conducted a 'review of reviews' of physical activity interventions, published between 2000 and 2011, to identify effective, promising, or emerging interventions from around the world. The authors searched the Database of Abstracts of Reviews of Effects (DARE), the Cochrane library, TRIP, PubMed (Medline), the American Psychological Association, National Guidelines Clearing house, and the System for Information on Grey Literature in Europe (SIGLE; OpenGrey) for systematic reviews of physical activity interventions in any language. Unlike the Achterberg, Huisman-de Waal, et al. (2011) review (above), the types of participants studied were children, adolescents, or adults *without* established disease. The types of interventions included were those that involved at least one of the three domains (1) campaigns and informational approaches, (2) behavioural/social approaches, (3) environmental and policy approaches and that lasted 3- months or longer; had a detailed study protocol; and had at least one measure for physical activity outcomes. Only the results related to (2) behavioural/social approaches are summarised here. In total, Heath and Parra et al. (2012) included 100 reports: 76 narrative systematic reviews; 5 reviews of reviews; 19 meta-analyses. While the review is comprehensive, the depth of reporting suffers as a

result of the very broad scope and the resultant high number of included studies.

Heath and Parra et al. (2012) found that individually adapted programmes to change health behaviour are generally characterised by a multi-component intervention approach. Social support in community settings is an example of a strategy that capitalises on social networks to reinforce physical activity behaviour. Behavioural and social approaches include creation of buddy systems, behavioural contracts between the participant and programme leaders, and formation of walking or other physical activity support groups. Heath and Parra et al. (2012) reported that, in general, these initiatives to increase social support for physical activity can effectively promote physical activity. The authors found insufficient evidence to recommend provider-based physical activity counselling as a single component intervention but found that the approach has promising results when integrated into existing community efforts. The effect sizes were reported as follows: physical activity counselling in health-care, $d = 0.16$; behaviour change interventions, $d = 0.32$. The authors note the larger effect sizes for interventions delivered in older populations $d = 0.26$ and in populations with established disease (e.g. obese populations) $d = 0.44$ as compared to the relatively small effect size for all interventions delivered in healthy adult populations overall $d = 0.19$). These findings led Heath and Parra et al. (2012) to conclude that individuals do need to be informed and motivated to adopt physical activity, and that the public health priority

should also be to ensure that environments are safe and supportive of health and wellbeing.

Conn and Hafdahl et al. (2011) conducted a meta-analysis of interventions to increase physical activity solely among healthy adults. Two research questions were addressed (1) what overall effects do interventions designed to increase physical activity have on physical activity behaviour? And (2) do interventions' effects on physical activity behaviour vary depending on intervention type, methodology, or sample characteristics? The meta-analysis involved 358 trials including 564 pair-wise comparisons. The search strategy involved broad search terms that were applied systematically in 13 databases, 36 research registers, and hand-searching of 82 journals from 1960 through 2007. This extensive search yielded 54642 papers to consider for inclusion of which 358 were selected involving a total of 99,011 healthy adult participants, mean age 44 years.

The interventions analysed included access enhancement, barriers management, competition, contracting, consequences or rewards, cues or stimulus control, decision making, education about the health benefits of physical activity, exercise prescription, feedback, goal setting, modelling, monitoring physical activity behaviour by research staff, problem solving, relapse prevention education, and self-monitoring and motivational interviewing. The outcome was physical activity, specifically; the estimates of mean physical activity effect sizes converted to the original metrics of

ambulatory steps per day and minutes per week. The analysis used a mixed-effects meta-analytic analogue of regression. The overall mean effect size or comparisons of treatment groups versus control groups was $d = 0.19$ and this effect size was calculated to be consistent with a mean difference of 496 ambulatory steps per day between treatment and control participants. In contrast, control participants did not experience increased physical activity by participating in studies, as evidenced by a mean effect size of $d = 0.00$.

Exploratory moderator analyses suggested that the characteristics of the most effective interventions were behavioural interventions $d = 0.25$ instead of cognitive interventions, face-to-face delivery versus mediated interventions (e.g., via telephone or mail), and targeting individuals $d = 0.19$ instead of communities $d = 0.09$. Also, interventions that included a train-the-trainer approach were less effective $d = 0.09$ than were interventions with research staff providing interventions directly to participants $d = 0.21$ and studies *without* the Transtheoretical model reported larger effect size $d = 0.21$ than did studies with the model $d = 0.15$. The authors suggest that the results of the moderator analyses should be used to interpret findings and to guide future intervention design.

Overall, the authors note that the effect size from these studies of healthy adults is smaller than the effect size reported for chronically ill adults in their earlier 2008 study $d = 0.45$ as well as the effect size reported for

chronically ill and healthy adults and children $d = 0.72$ (Dishman & Buckworth, 1996). This led the authors to conclude that the presence of chronic illness may cause patients to be more responsive to interventions but in healthy populations, on average, the magnitude of physical activity behaviour change was modest and that the achieved steps per day did not meet public health goals of 10,000 steps-per-day. To express the effect size in the metric of steps-per-day, the authors calculated that middle 95% of true effect sizes falls between -0.14 and 0.53 , therefore, the true mean difference for treatment participants could plausibly range from 11 minutes per week less to about 40 minutes per week more, or -371 to $+1363$ steps-per-day. Therefore, Conn and Hafdahl et al. (2011) suggest that researchers and programme designers should emphasize behavioural strategies (over cognitive approaches) and continue to explore which components of behavioural interventions are most effective. Health care providers and public health programs often emphasize physical activity's health benefits, but the results of this study found that health education *did not* increase effect size.

Park et al. (2012) conducted a Cochrane systematic review (meta-analysis) of partner support interventions to improve smoking cessation. The search terms used to capture the social support component included family, marriage, spouse, partner, sexual partner, buddy, friend, co-habitees, and co-worker. The review included randomized controlled clinical trials of smoking cessation interventions that compared an intervention that

included a partner support component with an otherwise identical intervention that did not include partner support, and reported follow up of six months or more. The interventions were those designed to enhance partner support for smokers in cessation programmes including spouses, friends, co-workers, 'buddies', or other significant others who supported the smokers as a part of the cessation programme to which they were assigned. The primary outcome was self-reported abstinence of the smoker (not the partner) or biochemical assessment (carbon monoxide levels, saliva), assessed at least six months following the initiation of treatment. A secondary outcome of interest was the level of partner support, as assessed by the Partner Interaction Questionnaire (PIQ), or by other methods, if reported. Six studies attempted to enhance the partner support component by general methods (video tape, booklet, support manual, guide, phone contact, lecture, demonstration, practice exercise) and five studies gave group training to the partners for partner intervention. The 11 included studies were published between 1981 and 2006, covering a total of 2172 participants (1048 intervention/ 1124 control). The number of participants per study ranged from 24 to 1003.

Park et al. (2012) found no evidence of an effect at either follow-up point: at six to nine months the estimated pooled relative risk (RR) was 0.99 (95% CI 0.84 to 1.15, 13 studies) and at 12 months or greater the RR was 1.04 (95% CI 0.87 to 1.24, 6 studies). Nine studies assessed partner support and of these two studies reported an increase and four studies reported no

difference in partner support and one study reported a decline in positive partner support between baseline and 12months.

Park et al. (2012) compared their results to previous findings: specifically that support from a spouse *has* been shown to be highly predictive of successful smoking cessation in some studies, in particular, supportive behaviours involving cooperative behaviours, such as talking the smoker out of smoking the cigarette, and reinforcement, such as expressing pleasure at the smoker's efforts to quit. And, negative behaviours such as nagging the smoker and complaining about smoking have been demonstrated to be predictive of relapse. In a previous meta-analysis conducted as a part of the US Agency for Health Care Quality and Research (AHRQ) guidelines (Fiore 2000), it was estimated that social support interventions might increase smoking cessation rates by three to five per cent, but Park et al. (2012) did not replicate this finding. Park et al. (2012) further commented that their findings are consistent with those of Westmaas et al. (2010), in their review of smoking cessation theory, in that the majority of studies assess partner support *supplemental* to an established cessation intervention. That is, a lack of significant effect detected in studies of social support interventions may be due to a 'ceiling effect', whereby established treatments given to both the intervention and control groups may have adequately met smokers' support needs.

Considering what was already known about partner support in smoking cessation, and the fact that there was no evidence of an effect at either follow-up point in their review of the topic, Park et al. (2012) acknowledged that the literature in this area is still somewhat confusing and that pre-existing support and partner smoking status need to be controlled for in future studies. Park et al. (2012) concluded that the studies do suggest that partner support and the absence of partner criticism may be important in smoking cessation, but that these behaviours are not easily changed by the interventions used in these studies. Park et al. (2012) recommend that future interventions should pay more attention to the quality of the partner interaction and be more effective at actually increasing partner support.

May and West (2000) conducted a systematic review of the smoking cessation literature regarding the use of 'buddy systems' (where smokers are specifically provided with someone to support them) to aid smoking cessation. The search strategy covered Medline and Psyclit using the key words “smoking”, “smoking cessation”, “social support”, and “buddy”; from 1980 to 2000 and included only randomised controlled trials. Ten studies were identified: nine were clinic based smoking trials, eight used a group format. The interventions all involved the use of a social support, including a 'buddy' (either using buddies from among smokers' existing relationships (nine studies) or from within groups (one study). The 'buddy' support interventions were of two broad types. The majority were directed support interventions, using populations who identified buddy support

before randomisation. These studies therefore made use of pre-existing support structures. They attempted to improve the quality of support with training, drawing on previous research to indicate what is beneficial. Only one study fell into the second category of the initiation of new ties. All the studies involved some level of guidance to buddies and/or smokers regarding how to be supportive. To what extent support training was provided varied from intensive group treatments involving role playing and rehearsal to a simple instruction to call each other regularly.

All but one of the studies used point prevalence rate of smoking abstinence as their outcome measure, and arguably, this is not a particularly stringent test of programme performance. Typically abstinence was defined as no smoking in the previous week for the later follow-ups, therefore participants may relapse following the intervention but stop again using an entirely different method at a later date and still be counted as a treatment success.

May and West (2000) summarised their results in a narrative synthesis and reported that such studies have generally found that having such a buddy is positively correlated with success in stopping smoking. In some circumstances participants who engaged a buddy were three times more likely to quit. However, the finding is not universal. May and West (2000) presented several conclusions based on their review of the literature, firstly that many people did engage a buddy when prompted to and this suggests

the practicality of simple social support manipulations if they can be shown to be effective. Further, May and West (2000) comment extensively on the *nature* of the relationship. In most cases researchers were attempting to influence pre-existing supportive relationships, often with a spouse. Interventions involving new ties (common adversity) and interventions using existing ones can both offer the buddies various levels of training. However, the latter involve attempting to develop or change an established relationship. May and West (2000) assert that other behavioural research suggests that these relationships can be very resistant to change. The authors also note that much of the research has required pre-existing support as an inclusion criterion and that it may be that socially isolated smokers benefit more from interventions involving new ties. Finally, May and West (2000) highlight the importance of further investigation into the role of different aspects of buddy support, in particular the possibility of unintended effects. Such effects include smokers benefiting initially from the support of a new tie when quitting, but then experiencing greater relapse rates when the support ends, whereas pre-existing support may continue its influence over a longer period. While this review was of good quality, it should be noted that in the time period covered by this review most research in the area did not use a randomised design so only a small proportion of the originally identified studies were included.

4.13 Systematic reviews: summary

The majority of studies included in the five reviews assessed partner support *supplemental* to an established group programme, and these were most commonly smoking cessation interventions. In most cases researchers were attempting to influence pre-existing supportive relationships, often with a spouse, and in just a few cases, programme participants were paired (new ties) with other participants within groups (common adversity). In the main, the authors of the five reviews highlight the potential that social support interventions offer and the promise shown by the limited range of studies conducted to date. However, the effects of such interventions are highly variable and the literature in this area still somewhat unclear. There was notable heterogeneity in the way in which authors described similar interventions, and in the terminology and claimed theoretical underpinnings for some of the interventions and this makes comparisons between studies difficult. Populations differed also. Some studies involved only participants with established disease while others involved apparently healthy individuals (treatment versus prevention). While this arguably creates two essentially different research questions, the paucity of evidence in this field generally makes it relevant to evaluate any *disease* versus *healthy* populations side-by-side so that interventionists can try to analyse and optimise the potential strengths and weaknesses of different intervention components and methods within future programme designs.

Broadly, the results were encouraging and some studies did demonstrate a statistically significant incremental effect when adding a support-buddy to an existing programme, however many did not. Further, as most research has been conducted in the context of smoking cessation, it is not known how or to what degree these findings generalise to other behaviour change situations in other populations. It does appear that there are differences between *stopping behaviours* and *adopting/maintaining behaviours* and how this plays out with respect to the support provided by a buddy is not known. For example, non-participant buddies in weight-loss or physical activity interventions might be 'expected' to provide support for up to 12-months and beyond, and this expectation may simply be too high.

Programmes also varied greatly in the amount and type of training that was provided to the participant's support buddies. The methods reported included video tape, booklet, support manual, guide, phone contact, lecture, demonstration, practice exercises and checklists of helpful behaviours. However, the effectiveness of this training was rarely if ever evaluated. No study specifically set out to evaluate the incremental effectiveness of buddy training. Achterberg et al. (2011) suggest that intervention components such as the training strategies directed at supporters need to be evidence based and actually helpful when trying to enhance social support and buddy relationships. For example, the information presented in the review by Achterberg et al. (2011) suggests that if knowledge (only) techniques are

not particularly effective with patients then it is likely that they may not be particularly effective with buddies either.

Finally, it was a common finding that most often researchers were attempting to influence pre-existing supportive relationships, often with a spouse. Interventions involving new ties were much less common. At least within the context of smoking cessation groups, the evidence suggests a probable 'ceiling effect', whereby established group treatment programmes already adequately meet smokers' support needs and the addition of a new tie from within the group, for most, adds little. All of the reviewers concurred that partner support and the absence of partner criticism appear to be important factors for individual level health behaviour change, but that these attitudes and behaviours were often not readily changed by the interventions typically used. May and West (2000) found this to be particularly relevant to smoking cessation interventions and Park et al. (2012) recommend that future interventions should pay more attention to the quality of the partner interaction *and* be more effective at actually increasing partner support.

4.14 Systematic reviews: conclusions

Taken together, these five reviews provide extensive information from an enormous range of interventions, comparisons, outcomes, settings, contexts and study designs derived from hundreds of studies spanning the last 30 years. The evidence suggests that in order to maximise the potential of

behaviour change programmes, a 'comprehensive package' or multi-component intervention needs to be delivered and that such interventions should strive to harness social support as a mechanism of change. Researchers should consider the opportunities to incorporate *intra-treatment* social support (support provided within treatment sessions and groups) as well as extra-treatment social support (on-going support provided outside of or following treatment sessions) in behaviour change programmes. More research is required to test the best ways to achieve this. It might be that it is better to train and 'shape' support people to improve their performance and the quality of support that they provide or it might be that it is better to invest resources in helping participants choose more wisely from the onset: this 'match-up' or 'patch-up' question remains unanswered. Researchers should also consider the possibility of unintended negative consequences such as greater relapse rates when support ends.

4.15 Original primary studies: introduction

The searches identified 14 eligible primary research studies and the summary characteristics of these included studies are first presented in **Table 9**. Heterogeneity of the studies in terms of population, interventions assessed, control groups, as well as outcome measures and follow-up periods, precluded undertaking a meta-analysis. Throughout the following section, the study results are grouped according to the targeted health behaviour (starting with smoking cessation being the most commonly studies) and ordered by descending level of evidence and publication date. The summary table is followed by a narrative description of each of the included studies (beginning on p.113), followed by a narrative synthesis and summary of the evidence. Eight studies were of smoking cessation programmes (five RCTs and three non-randomised trials), two studies addressed physical inactivity (one RCT and one non-randomised trial), two randomised trials addressed alcohol use, one study addressed diabetes and one osteoarthritis (both RCTs). The number of participants included in the trials varied from 20 to 563 (average 204). The control interventions were most commonly 'usual care' with four studies also adding either a different combination of or level of intervention components or an additional 'no treatment' group in a three or four-group design. All studies aimed to test the incremental effectiveness of adding a support person or buddy to a multi-component behaviour change intervention. Detailed data extraction tables can be found in **Appendix E**.

Table 9: Summary characteristics of the included primary research studies

Table 9: Summary characteristics of the included primary research studies										
Albrecht (2006)	A randomized controlled trial of a smoking cessation intervention for pregnant adolescents.	Evidence level = II Quality = Good n=142 Indication = SMOKING								
Brief description: RCT To examine differences in short- and long-term smoking behaviours among three groups: Teen FreshStart (TFS), Teen FreshStart Plus Buddy (TFS-B), and Usual Care (UC) control.										
Outcomes	Intervention	Results summary								
Self-reported smoking status was assessed using the Smoking History Questionnaire (SHQ) + saliva cotinine levels to verify abstinence.	8-week group program based on the Cognitive Behavioural Theory plus adding a non-smoking female of a similar age as their buddy to the sessions. No specific buddy training.	A significant difference was found between the UC group (11% abstinence) and the TFS-B group (35% abstinence) at 8-weeks (p = .010, 99% CI = 1.001, 13.893). But not sustained beyond postpartum 1-year following study entry: UC group (11% abstinence), TFS group (12% abstinence) and the TFS-B group (9% abstinence) all n/s.								
Summary paragraph: The TFS-B intervention was significantly more effective in attaining short-term smoking cessation in the pregnant adolescent than UC but was not different than TFS alone. It was demonstrated in this study that young pregnant smokers have difficulty with relapse, just like their adult counterparts.										
May (2006)	Randomized controlled trial of a social support ('buddy') intervention for smoking cessation.	Evidence level = II Quality = Good n=563 Indication = SMOKING								
Brief description: A cluster-RCT to assess the effectiveness of including a social support intervention ('buddy system') in a group treatment programme to aid smoking cessation.										
Outcomes	Intervention	Results summary								
Self-reported Abstinence at 1, 4, and 26 weeks + carbon monoxide + motivation, determination, perceived likelihood of stopping, and support, via survey.	Groups in which smokers were paired with another person to provide mutual support (buddy condition). Participants were seen weekly for the first 4 weeks after stopping then followed up again after 26 weeks. No particular training or advice was given to smokers.	<table><tr><th>Time</th><th>Adjusted OR (95% CI)</th></tr><tr><td>1 week</td><td>1.45 (0.92–2.29)</td></tr><tr><td>4 weeks</td><td>1.16 (0.76–1.78)</td></tr><tr><td>26 weeks</td><td>0.79 (0.48–1.29)</td></tr></table> No significant differences between groups.	Time	Adjusted OR (95% CI)	1 week	1.45 (0.92–2.29)	4 weeks	1.16 (0.76–1.78)	26 weeks	0.79 (0.48–1.29)
Time	Adjusted OR (95% CI)									
1 week	1.45 (0.92–2.29)									
4 weeks	1.16 (0.76–1.78)									
26 weeks	0.79 (0.48–1.29)									
Summary paragraph: This system was chosen as it is the standard procedure in group clinics using the withdrawal-oriented model, it had shown efficacy in previous research and it is easy to implement in a group setting (compared to spouse/partner training or recruiting ex-smoker volunteer buddies). The intervention effect probably should not have been expected to be large given that it used 'non-significant other' buddy pairs with essentially no training ... within an already supportive group setting (although this need not be the case within individual treatment or self-help programmes). Possibilities for increasing the strength of the buddying intervention include: (1) firmer guidance/training (2) a more rigorous protocol for establishing a new relationship between members of buddy pairs who have lost a partner (3) pairing up smokers at the initial visit rather than on the quit day.										

Table 9: Summary characteristics of the included primary research studies
(continued)

Donatelle (2000)		
Randomised controlled trial using social support and financial incentives for high risk pregnant smokers: significant other supporter (SOS) program		Evidence level = II Quality = Good n=220 Indication = SMOKING
Brief description: Cluster RCT To determine whether the combination of bolstered social support and financial incentives had an effect in significantly reducing smoking behaviour among low income, high risk, pregnant and postpartum women participating in a women, infants, and children program.		
Outcomes	Intervention	Results summary
Self-report smoking status and written surveys and salivary cotinine	Verbal and written information on the importance of smoking cessation, a maternal specific, evaluated, smoking cessation self-help kit AND treatment participants were asked to designate a social supporter, preferably a female non-smoker with whom the participant had a regular, close, positive association, PLUS participant and her social supporter were eligible to receive incentive vouchers.	Significant differences existed between treatment and non-buddy control groups in percentages of smokers who were biochemically confirmed as quit at eight months gestation: quit rate 32% (intervention) 9% (control) ($p < 0.0001$), and also at two months postpartum quit rate 215 (intervention) 6% (control) ($p < 0.0009$). High loss to: (a) treatment loss 32% at eight months gestation, and 36% at two months postpartum; (b) control loss was 51.5% at eight months gestation, and 52% at two months postpartum. The supporter's purpose was to offer "natural", peer support during the smoking cessation process to the woman who was trying to quit but had no formal support-person training
Summary paragraph: The supporter's purpose was to offer 'natural', peer support during the smoking cessation process to the woman who was trying to quit but had no formal support-person training.		
West (1998)		
A randomized controlled trial of a 'buddy' system to improve success at giving up smoking in general practice.		Evidence level = II Quality = Good n=172 Indication = SMOKING
Brief description: RCT to assess the effect on abstinence rates of pairing up smokers attending a general practice smokers' clinic to provide mutual support between clinic sessions.		
Outcomes	Intervention	Results summary
The percentage of smokers still abstinent from cigarettes at end of treatment (4 weeks from quit date), verified by expired air carbon monoxide concentration.	Smokers see a practice nurse in pairs (buddy-system) for 20 min sessions. Buddy pairs were introduced to each other while waiting to be seen together. In addition, as a voluntary adjunct, they were invited to enter into a contract with a small incentive amount of money wagered on abstinence. They were scheduled to attend all further sessions together. No specific 'training' in buddy skills was provided. Prescription for NRT given along with a simple set of guidelines on maintaining abstinence and the importance of not smoking.	40% of subjects were still abstinent 1-week after the quit date in the buddy condition compared with 22% in the solo condition ($p < 0.01$). Twenty-seven % of subjects in the buddy condition were still abstinent at the end of treatment (4-weeks after the quit date) compared with 12% in the solo condition ($p < 0.01$). The analysis showed that the odds of patients in the buddy condition remaining abstinent after 1-week were 2.5 times those of solo patients ($p < 0.02$) and after 4 weeks the corresponding odds ratio was 2.6 ($p < 0.05$).
Summary paragraph: There was clear evidence for efficacy and, given that the buddy system is a minimal cost element of a smokers', clinic package, the cost-efficacy is very high.		

Table 9: Summary characteristics of the included primary research studies
(continued)

Gruder (1993)	Effects of social support and relapse prevention training as adjuncts to a televised smoking-cessation intervention.	Evidence level = II Quality = Good n=558 Indication = SMOKING
Brief description: Cluster-RCT (four-group) To test the effectiveness of brief group adjuncts (buddy and group or group only: both that taught social support and relapse prevention skills) to a cessation intervention comprised of a television program and written self-help materials.		
Outcomes	Intervention	Results summary
Self-reported abstinence rates for single-point prevalence and multiple-point prevalence.	Self-help manual; television broadcasts based on the manual; + 3 weekly 90-min group meetings during the 20-day program; leader-initiated telephone calls 1 and 2 months after the program + bring a non-smoking buddy to the second meeting; +buddy & participant training.	No-contact control (n=109) 12.8% single point prevalence abstinence 1.8% multiple-point prevalence. No shows (n=190) 13.7% single point prevalence abstinence 2.6% multiple-point prevalence. Discussion (n=86) 18.6% single point prevalence abstinence 4.7% multiple-point prevalence. Social support (n=104) 21.2% single point prevalence abstinence 7.7% multiple-point prevalence. At 24 months no-contact controls versus others (p < .001); no shows versus two group conditions(p < .006); discussion versus social support (p < .03). Significant differences through 24 months attributable to the strong intervention effects on cessation, not to significant differences in maintenance.
Summary paragraph: The social support condition significantly enhanced the initial cessation rates both by increasing support provided by a buddy and by increasing the use of the self-help manual and television program and it also increased the levels of support received by smokers: specifically, the social support training for smokers and their buddies increased the ratio of positive to negative interactions, primarily by decreasing unhelpful (e.g., nagging, policing) smoker-buddy interactions. The social support condition did not significantly enhance maintenance through reducing relapse rates.		
Hennrikus (2010)	Increasing support for smoking cessation during pregnancy and postpartum: Results of a randomized controlled pilot study.	Evidence level = III Quality = Good n=82 Indication = SMOKING
Brief description: RCT To examine the feasibility and effectiveness of an intervention to mobilise women in the social networks of pregnant smokers to support smoking cessation.		
Outcomes	Intervention	Results summary
Self-reported seven-day point prevalence abstinence validated with urine cotinine; number cigarettes per day; smoking status of supporters. Self-report of 29 behaviours by their supporter.	Subject session: single counselling session for all subjects was designed to increase motivation to quit and provide information. Supporter sessions: supporter and counsellor identified specific activities to support the subject's efforts to quit: Subsequent telephone contacts reviewed support efforts and planning for upcoming month.	At the end of pregnancy, intent-to-treat analysis showed a non-significant trend for more validated quits in the intervention group: 13.0% vs. 3.6% among the controls. Intervention subjects who chose friends as supporters were more likely to quit (21.7%) than were women who chose relatives (6.5%). There was a non-significant trend for more validated quits when supporters were ex-smokers (18.2%) than when they were never smokers (13.3%) or current smokers (10.7%). Considerable relapse at 3 months postpartum: quit rates decreased to 9.3% in the intervention group and 0% in the control group.
Summary paragraph: Because this was a pilot study, it was not powered to detect the expected intervention effect. Increasing support from a female friend or family member is a promising prenatal smoking cessation strategy. Finding that friends might be more effective supporters than family members is consistent with the observation that social exchanges between partners, or by extension with family members, might be so stable that they are difficult to change. Allocated considerably resources to training and working with the support people (Buddies) to develop their helping strategies (more input than with the smoking subjects).		

Table 9: Summary characteristics of the included primary research studies
(continued)

Gulliver (2004)	Tobacco cessation treatment for pregnant smokers: Incorporating partners and incentives.	Evidence level = III-1 Quality = Fair n=20 Indication = SMOKING
Brief description: RCT pilot study to evaluate a tobacco cessation treatment for pregnant smokers: incorporating partners and incentives.		
Outcomes	Intervention	Results summary
Smoking abstinence was defined as expired CO < 10ppm on a Bedfont CO monitor. Smoking history questionnaire, self-efficacy, partner support, stage-of-change.	A 60-minute manual-guided session conducted by a clinical psychologist in 'partner' or 'no partner' groups. Functional analysis/individualized plan; self-help materials; incentive programme; follow-up; tip sheet for partner support.	With regard to partner participation, women who participated in treatment with their partner were significantly more likely to quit on their scheduled quit date, $p < .05$ and to remain quit at one-month follow-up, $p < .05$ compared to those women who received treatment without the involvement of their partners. In this small pilot project, inclusion of a partner in the program improved outcome. Note: only one month follow-up.
Summary paragraph: The role of pregnant women's partners in supporting their ability to quit smoking appears important. Even in this small sample, inclusion of partners in the smoking treatment led to better smoking cessation rates. Partners generally were interested in helping.		
Carlson (2002)	The addition of social support to a community-based large-group behavioural smoking cessation intervention: Improved cessation rates and gender differences.	Evidence level = III-2 Quality = Good n=557 Indication = SMOKING
Brief description: Non-randomised trial to determine the effects on cessation rates of adding a partner support group component to a large-group community-based behavioural smoking cessation program.		
Outcomes	Intervention	Results summary
Self-report 3-month continually abstinent Self-report 6- and 12-month follow-ups, point-prevalence rates	Participants: group sessions with support buddy (including two separate training sessions for the buddies). Main group program has eight sessions spread out over 3 months Support people: two of the eight sessions, 1 week prior and 1 week following the quit date. Discussion, training & education. Support people were spouses, children, parents, and/or friends of individuals participating in the smoking cessation program.	Overall rate of successful smoking cessation at 3 months: 41.5% (231/557); for those with a support person, the cessation rate was 56.1% (83/148), compared to 36.2% (148/409) for those without a support person ($P < .001$). – At the 6-month point, overall, 37.6% (165/439); with a support person, 45.5% (55/121); without a support person, 34.6% (110/318) ($P < .05$) (n=439). – At the 12-month follow-up: overall, 35.1% (155/442); with a support person, 43.2% (54/125); without a support person, 31.9% (101/317) ($P < .05$) (n=422).
Summary paragraph: The results of this study confirm, in a large sample of smokers, previously reported associations between social support and success at smoking cessation. The overall success rates of this program, with abstinence rates of 42%, 38%, and 35% (39%, 28%, and 26% using intent-to-treat analyses) at 3, 6, and 12 months, respectively, are higher than those found in other large-group behavioural cessation programs.		

Table 9: Summary characteristics of the included primary research studies
(continued)

Morgan (2011)	The 'healthy dads, healthy kids' randomized controlled trial: Efficacy of a healthy lifestyle program for overweight fathers and their children.	Evidence level = II Quality = Good n=53 Indication= INACTIVITY
Brief description: RCT to evaluate the feasibility and efficacy of the 'Healthy Dads, Healthy Kids' (HDHK) program, which was designed to help overweight fathers lose weight and be a role model of positive health behaviours for their children.		
Outcomes	Intervention	Results summary
Fathers and their children assessed for weight, waist circumference, BMI, BP, resting HR, physical activity and self-reported dietary intake.	Sessions that included the child included practical fitness, fun and fundamental movement skills, circuit, rough and tumble activities, 'Playing strong' and partner fitness challenges and Ball and game skills.	HDHK fathers losing more weight (-7.6 kg; 95% confidence interval (CI) -9.2, -6.0; d=0.54) than control group fathers (0.0 kg; 95% CI -1.4, 1.6). In children, significant treatment effects (P<0.05) were found for physical activity (d=0.74), resting heart rate (d=0.51) and dietary intake (d=0.84).
Summary paragraph: Theory postulates a complex theoretical framework of reciprocal relationships among family members. That is, when a parent changes his or her physical activity and dietary behaviour, this will be reflected in the child's behaviour. According to Bandura, this reciprocal reinforcement between family members is particularly important when changing and sustaining new behaviours. That is, both fathers and children mutually reinforced healthier behaviours. The HDHK program was unique in that it was designed to engage fathers as key agents of behavioural change in their families.		
Cholewa (2008)	Project impact: Brief report on a pilot programme promoting physical activity among university students.	Evidence level = III-3 Quality = Fair n=71 Indication= INACTIVITY
Brief description: A non-randomised controlled trial with nine-week follow-up to evaluate the effectiveness of a buddy system, record-keeping device, or both for increasing university students' physical activity (PA).		
Outcomes	Intervention	Results summary
Self-reported physical activity, barriers efficacy, task efficacy, and BMI	Information session tailored for each intervention arm. Two same-sex individuals who worked together to increase their PA were paired. A five level matching criterion was utilized OR a commercial, password protected on-line logbook was utilized for participants to track their activity frequency, duration, goals, and progress OR both logbook and buddy. A combination of both "buddy" and "on-line logbook"	<ul style="list-style-type: none"> – A positive and significant effect in activity status over time existed for the combination arm of the study ($p < .05$) effect size = .04 (small). – A positive and significant effect in activity status over time existed for the recordkeeping device, ($p < .05$) effect size = .52 (large). – With regard to adoption, maintenance, and termination of PA status, 15 (29.4%) participants in the study adopted more PA. Twenty (39.2%) participants maintained activity, and five (9.8%) terminated activity. Finally, 11 (21.6%) participants remained inactive. <p>However, the buddy system intervention, on its own, was not impactful.</p>
Summary paragraph: Participants were assigned to their preferred arm of the study. A very low level intervention essentially with no 'motivational' or counselling element up-front and no training of buddies in their role as all were participants. Buddies were 'matched participants' not participant selected significant others.		

Table 9: Summary characteristics of the included primary research studies
(continued)

Fals-Stewart (2006)	Learning sobriety together: A randomized clinical trial examining behavioural couple's therapy with alcoholic female patients.	Evidence level = II Quality = Good n=138 Indication= ALCOHOL
Brief description: RCT to examine the comparative effects of behavioural couples therapy on the outcomes of married or cohabiting alcoholic female patients and their non-substance-abusing spouses or intimate partners		
Outcomes	Intervention	Results summary
Urine and blood alcohol breath samples, percentage of days abstinent. Self-report of adverse drinking consequences. Relationship adjustment.	Behavioural couple's therapy (BCT): 32 sessions, both partners attending 12 BCT treatment sessions together then next 20 sessions, female patients participated in individual, 12-step facilitation sessions for the treatment of alcoholism, which the non-substance-abusing male partners did not attend. In the 12 BCT sessions, the non-substance-abusing partner was an active participant in the intervention.	No significant difference between groups in terms of PDA status at post-treatment because all of the interventions were fairly effective in reducing reported drinking during treatment, with most patients in all conditions reporting abstinence or very low levels of drinking. However, during the 12-month follow-up, female patients in BCT increased their drinking at a significantly slower rate than the other groups.
Summary paragraph: Female patients who received IBT or PACT, those who participated in BCT reported significantly fewer days of drinking and higher levels of dyadic adjustment during a 12-month post-treatment follow-up period. This study provides good empirical support for the use of couple-based treatments in terms of improvements in primary targeted outcomes such as substance use and relationship adjustment, and also in other areas that are of clear public health significance. However, the programme was very intensive.		
Tevyaw (2007)	Peer enhancement of a brief motivational intervention with mandated college students.	Evidence level = II Quality = Fair n=36 Indication= ALCOHOL
Brief description: RCT to evaluate whether incorporating a peer in a brief motivational intervention would lead to significant reductions in alcohol use and problems in students mandated to receive treatment after violating campus alcohol policy.		
Outcomes	Intervention	Results summary
Number of drinking days and heavy drinking days at 1-month follow-up, assessed with the Time Line Follow-Back Interview. Alcohol-related problems in the past year via Young Adults Alcohol Problem Screening Test (YAAPST).	Two 45-min sessions of motivational interviewing a peer-enhanced motivational intervention. Peers: not a romantic partner; same gender; see participant at least once a week; rated 'important', and 'supportive'. Peers not specifically trained in their roles. Asked to help generate, develop and implement helpful strategies.	Effect sizes revealed that the magnitude of within-group reductions in alcohol use and problems were three times larger on average for the buddy support group (average effect size = 0.68) than for the individual group (average effect size = 0.22). Moderate between-group differences were observed for number of drinking-days and alcohol-related problems. Overall, small effect sizes were observed for peers of participants. No p-values so assume all results non-significant given the small sample size.
Summary paragraph: The findings suggest that including peers in behaviour modification interventions may be an effective way to facilitate drinking reductions in mandated students who have already begun to demonstrate negative consequences from their drinking.		

Table 9: Summary characteristics of the included primary research studies
(continued)

Keogh (2011)	Psychological family intervention for poorly controlled type 2 diabetes.	Evidence level = II Quality = Good n=121 Indication= DIABETES
Brief description: RCT To evaluate the effectiveness of a psychological, family-based intervention to improve diabetes-related outcomes in patients with poorly controlled type 2 diabetes.		
Outcomes	Intervention	Results summary
Glycated haemoglobin (HbA1c). Self-reported beliefs about diabetes, psychological well-being, diet, exercise, and family support.	Usual care + 3 weekly sessions by a health psychologist, first 2 sessions in patient's home with their buddy. The third session involved a 10-to 15-minute follow-up telephone call. The intervention used motivational interviewing.	At 6-month follow-up, the intervention group reported significantly lower mean A1C levels than the control group (8.4% [SD = 0.99%] vs 8.8% [SD = 1.36%]; P = .04). The intervention was most effective in those with the poorest control at baseline (A1C >9.5%) (intervention 8.7% [SD = 1.16%, n = 15] vs control 9.9% [SD = 1.31%, n = 15]; P = .01).
Summary paragraph: The psychological family-based intervention for patients with poorly controlled type 2 diabetes led to improvements in glycemic control, diabetes perceptions, psychological well-being, self-management behaviours, and family support. However, both groups continue to have unacceptably high A1C levels at follow-up, with neither group achieving optimal glycemic control targets.		
Martire (2007)	Couple-oriented education and support intervention: Effects on individuals with osteoarthritis and their spouses.	Evidence level = II Quality = Fair n=142 Indication= ARTRITIS
Brief description: RCT (three group) To determine whether a couple-oriented education and support intervention for osteoarthritis was more efficacious than a similar patient-oriented intervention in terms of enhancing spouses' support of patients and their positive and negative responses to patient pain.		
Outcomes	Intervention	Results summary
West Haven-Yale Multidimensional Pain Inventory used to evaluate pain patients' social environment.	Couple-oriented education and support based on osteoarthritis Self-Management Program protocol was small group education attended by participants and their spouses and topics were framed as couples' issues whenever possible. Spouses were 'directly trained' in being supportive with five monthly booster sessions conducted via telephone.	All analyses were conducted with the completers sample. Patients in the CES group experienced a greater increase in spouse support than did those in the PES group, p = .03. The effect size was small (Cohen's d = .22). Approximately 30% of the couples had dropped out of the study by the 6-month follow-up
Summary paragraph: Did not report on changes in patient pain or physical function only spousal support/interactions. However, this study is one of a handful designed to evaluate the comparative efficacy (changes in interactions with the spouse) of patient- and couple-oriented interventions for a chronic physical illness.		

Albrecht et al. (2006) conducted a smoking cessation trial that aimed to evaluate the short-and long-term effects of smoking cessation strategies tailored to the pregnant adolescent to attain and maintain abstinence. The study employed a three-group randomised design with repeated measures:

baseline, 8-weeks and 1-year follow-up, involving 142 pregnant adolescents who were aged 14 to 19 years. The experimental group (TFS-B) received an 8-week programme based on the Cognitive Behavioural Theory, and the participants were required to identify and bring a non-smoking female of a similar age as their buddy to the sessions. The role of the buddy was to reinforce smoking cessation strategies and to provide social support to the participant throughout the study. The TFS control intervention used the same programme without the buddy and the UC group received care that all teens would typically receive from a healthcare provider throughout their pregnancy (including that provided in antenatal classes) or at a centrally located community site. The study included both self-reported smoking status and saliva cotinine levels to identify smoking behaviours. A significant difference was found between the UC group (11% abstinence) and the TFS-B group (35% abstinence) ($p = .010$, 99% CI = 1.001, 13.893). A greater percentage of adolescents in the TFS-B group reported smoking abstinence at this time point. However, the effect was not sustained beyond postpartum 1-year following study entry: UC group (11% abstinence), TFS group (12% abstinence) and the TFS-B group (9% abstinence) all non-significant. (Albrecht, et al., 2006) concluded that the TFS-B intervention was significantly more effective in attaining short-term smoking cessation in the pregnant adolescent than UC but was not different than TFS alone. It was demonstrated in this study that young pregnant smokers have difficulty with relapse, just like their adult

counterparts. The peer-enhanced programme had a limited effect but could not sustain the effect well beyond postpartum (1-year following study entry). The intervention did not include any buddy specific training and the authors recommended that future studies should include relapse prevention training to sustain smoking abstinence into the postpartum period.

May and West (2006a) conducted a cluster randomised trial with successive groups of smokers attending a smoking cessation clinic. The aim was to assess the effectiveness of including a social support intervention or buddy system in an established group treatment programme to aid smoking cessation. The buddy system involved smokers pairing with another person (participant) to provide mutual support (buddy condition: n=237 in 14 groups) or (b) to receive the same treatment without the buddy component (control: n=326 in 20 groups). Participants were seen weekly for the first 4-weeks after stopping then followed up again after 26-weeks. Participants were invited to introduce themselves and were then asked to choose someone to be their buddy and sit down next to that person. They then swapped names and phone numbers with their buddy and arranged a time to make their first call, with subsequent calls alternating between them every day for the first week. No particular training or advice was given to smokers about the content of these calls they were simply described as a way of buddies offering mutual support between visits. This system was chosen as it was the standard procedure used in the clinic and it had shown efficacy in previous pilot research and it is easy to implement in a group

setting (compared to spouse/partner training or recruiting ex-smoker volunteer buddies). Expired-air carbon monoxide (CO) concentration was the primary outcome of interest. May and West (2006) found that smokers in the buddy condition were no more likely than smokers in the control condition to stay abstinent at one, four or 26 weeks. The effect was in the right direction at week one post-quit but after controlling for potential confounders the difference was not significant (odds ratio=1.45 (95% CI; 0.92-2.29), $p=0.06$). The authors concluded that this type of buddy system may not add substantially to the success rates in group based treatment programmes, where the level of support is already high. The intervention used 'non-significant other' buddy pairs (i.e. new ties) with essentially no training, within an already supportive group setting. May and West (2006) suggest that while their buddy system is a simple and very low cost addition to a group treatment programme, a more intensive or protracted form of buddying may be required.

Donatelle et al. (2000) conducted a cluster randomised trial across four sites, using social support and financial incentives for high risk pregnant smokers attending a women, infants, and children program. The intervention involved education, self-help materials, incentives and a significant other supporter (SOS) in a group programme delivered by trained staff. Participants were asked to designate a social supporter, preferably a female non-smoker with whom the participant had a regular, close, positive association. Participants and their social supporters were

eligible to receive incentive vouchers if the participant was biochemically confirmed as quit. All participants were telephoned monthly (maximum of 10-months), and were asked to self-report their smoking status (\$50 voucher if confirmed quit). The control group received the exact same intervention without the support person. Significant differences existed between treatment and control groups in percentages of smokers who were biochemically confirmed as quit at eight months gestation: quit rate 32% (intervention) versus 9% (control) ($p < 0.0001$), and also at two months postpartum quit rate 21% (intervention) versus 6% (control) ($p < 0.0009$).

The intervention strategy utilised a theory-based 'three pronged' approach: incentives, bolstered social supports, and community participation. Local resources were effectively mobilised to reduce the need for outside financial assistance as incentive vouchers were purchased with funds voluntarily donated from healthcare organisations, businesses, and foundations. The authors concluded that the intervention was effective as supporters offered 'natural' peer support during the smoking cessation process, even when given no formal support-person training.

West et al. (1998) assessed the effect on abstinence rates of pairing up smokers attending a general practice smokers' clinic to provide unstructured mutual support between clinic sessions. Using a randomised controlled trial, West et al. (1998) compared a 'buddy' condition with a

'solo' condition in which smokers received the same treatment but were not paired up. One hundred and seventy-two smokers were recruited by mail.

Smokers were introduced to each other while waiting to be seen by the practice nurse and then entered treatment in pairs (buddy-system) for a 20 min session. In addition, as a voluntary adjunct, they were invited to enter into a contract with a small incentive amount of money wagered on abstinence. They were invited to phone or otherwise contact each other at least once a day over the next week and at any time that they needed support. They were scheduled to attend all further sessions together. No specific training in buddy skills was provided beyond the above brief advice.

At the second session, a prescription for NRT was given along with a simple set of guidelines on maintaining abstinence and the importance of not smoking. Control group participants received the same intervention but were seen individually with no support person. The main outcome measure was the percentage of smokers still abstinent from cigarettes at end of treatment (4-weeks from quit date), verified by expired air carbon monoxide (CO) concentration. One week after the quit date, 40% of subjects were still abstinent in the buddy condition compared with 22% in the solo condition ($p<0.01$). At the end of treatment (4-weeks after the quit date), 27% of subjects in the buddy condition were still abstinent compared with 12% in the solo condition ($p<0.01$). West et al. (1998) concluded that

a buddy system can provide an effective element of a smoking cessation intervention at minimal cost, at least in the short term. Further research is needed to establish the long-term efficacy of this approach and examine the effectiveness of incorporating social support into other types of smoking cessation programmes.

Gruder et al. (1993) designed and implemented a four-group randomised trial to test the effectiveness of two brief group adjuncts to a cessation intervention comprising a television program and written self-help materials. The first experimental condition tested the incremental effect of adding a social support buddy with no special training to the standard programme. The second experimental condition added a social support buddy and special buddy education in social support and relapse prevention skills. The control condition was the standard programme as delivered in three scheduled group meetings. The fourth analysis group was composed of participants who failed to attend any of the scheduled meetings (no shows). The primary outcome was self-reported abstinence rates for single-point prevalence and multiple-point prevalence (percentage of subjects who met the criteria for abstinence at a given measurement wave and all previous measurement waves).

The social support condition significantly enhanced the initial cessation rates both by increasing support provided by a buddy and by increasing the use of the self-help manual and television program and it also increased the

levels of support received by smokers. At 24-months the 'trained buddy' group outperformed the untrained buddy group participants ($p < .03$) and both experimental groups outperformed the control groups ($p < .001$). However, the significant differences through 24-months were attributable to the strong intervention effects on cessation, not to significant differences in maintenance. Gruder et al. (1993) concluded that the social support group improved outcome by increasing both the level of support and program material use. They also highlighted however, that the challenge still remains to provide training in relapse prevention skills, typically within a limited time and with the low-level counsellor input available in such self-help minimal assistance type group programmes.

Hennrikus et al. (2010) examined the feasibility and effectiveness of an intervention to mobilise pregnant smokers in their social networks to support smoking cessation. Pregnant smokers ($n = 82$) identified a woman in their social network to help them quit smoking. Participants and their supporters were randomised into two groups. The intervention included one in-person session for intervention and control group subjects. Supporters (only) in the intervention group had one separate in-person visit with a counsellor about providing effective support and monthly telephone sessions; supporters in the control group were not contacted. The focus of the trial was to test the effectiveness of increasing the frequency and specifically the *quality* of support provided by the supporters. At least one counselling session was completed with 91% of the intervention group

supporters (range 1-6, median 3 sessions). The main measure of subject smoking was seven-day point prevalence with bio-chemical validation.

Compared with control subjects, intervention group subjects reported that their supporters had provided higher quality and more frequent support. There was a non-significant trend for more validated quits in the intervention group at the end of pregnancy: 13.0% vs. 3.6% among the controls (this was a pilot study and not powered to detect the expected intervention effect). However, there was considerable relapse at 3-months postpartum: quit rates decreased to 9.3% in the intervention group and 0% in the control group. This trial is novel in the extent to which it focused resources on training and pro-actively following up the support person or buddy. The authors concluded that increasing the frequency and quality of support from a woman in the smoker's social network is a promising prenatal smoking cessation strategy. This represents a different approach to working intensively with the smoker. Also of note, intervention subjects who chose friends as supporters were more likely to quit (21.7%) than were women who chose relatives (6.5%). There was a non-significant trend for more validated quits when supporters were ex-smokers (18.2%) than when they were never smokers (13.3%) or current smokers (10.7%). The intervention allocated considerably resources to training and working with the support buddies in an effort to develop their helping strategies (more input than that with the smoking subjects). This appeared to be effective, but less so for those smokers who 'recruited' their partner.

Gulliver et al. (2004) implemented a small randomised pilot study to evaluate a smoking cessation treatment for pregnant smokers: incorporating partners and incentives and applying a community reinforcement approach (CRA) model. Participants were randomly assigned to the 'partner' or 'no partner' groups at the baseline meeting. The intervention included several components: including a 60-minute manual-guided group session conducted by a clinical psychologist; a self-help manual (*Freedom from Smoking for You and Your Baby*); a functional analysis of smoking behaviour; the development of a quit smoking contract; regular check-ins throughout the pregnancy and the first three months of their infants' lives; a raffle ticket incentive scheme; and when the group included partners, a tip sheet describing partner support and effective communication was distributed and reviewed, and participants and partners outlined and agreed to appropriate support for the planned smoking cessation. The primary outcome was smoking status as assessed by a smoking history questionnaire and validated by expired carbon monoxide (CO).

Inclusion of a partner in the program improved outcome. Women who participated in treatment with their partner were significantly more likely to quit on their scheduled quit date ($p < .05$) and to remain quit at one-month follow-up ($p < .05$) compared to those women who received treatment without the involvement of their partners. Gulliver et al. (2004) concluded that the results show that it is possible to enlist a community's support in creatively funding such smoking cessation interventions. Finally, the role

of pregnant women's partners in supporting their ability to quit smoking appears important. Even in this small sample, inclusion of partners in the smoking treatment led to better smoking cessation rates.

Carlson et al. (2002) conducted a large non-randomised trial to determine the effects on cessation rates of adding a partner support group component to a large-group community-based behavioural smoking cessation program. Carlson et al, (2002) analysed the data from eight iterations of an established group smoking cessation programme offered through a cancer centre/clinic. The intervention adjunct included separate support group sessions for support persons of prospective quitters and six hundred smokers brought 156 support people with them to the groups. The standard group program had eight sessions spread out over 3-months. The group sessions with support buddy included two separate training sessions for the buddies, the first one week prior to the participant's quit date and then one week following the quit date. The sessions covered information about tobacco addiction, techniques for smoking cessation, expected withdrawal symptoms, supportive versus undermining (critical) behaviour, self-care for the support person, and specific problem-solving around issues raised by the participants. The primary outcomes were self-report 3-month continuous abstinence and self-report 6- and 12-month follow-ups, point-prevalence rates. For the participants with a support person, the cessation rate at 3-months was 56.1%, compared to 36.2% for those without a support person ($p < .001$). At the 6-month point, the cessation rate for

participants with a support person was 45.5% and 34.6% for those without a support person ($p < .05$). At the 12-month follow-up, supported participants achieved 43.2% abstinence and control participants 31.9% ($p < .05$). The beneficial effects of support were greater for the experimental group men, with supported men achieving more than 20% greater cessation rates than women and unsupported men after 12 months. Carlson et al. (2002) concluded that the results of their study confirmed, in a large sample of smokers, previously reported associations between social support and success at smoking cessation. The addition of a support person group to a large-group behavioural smoking cessation program was effective in improving 3-month cessation rates in both men and women, but over one-year of follow-up support was only associated with greater sustained abstinence in men.

Morgan et al. (2011) evaluated the feasibility and efficacy of the a 'Healthy Dads, Healthy Kids' program, which was designed to help overweight fathers lose weight and also be a role model of positive health behaviours for their children. Fifty-three fathers and their school-aged children were randomly assigned in family units to either the intervention group or a wait-list control. Fathers in the 3-month program attended eight face-to-face education sessions. Children attended three of these sessions. The total program contact time was 600 min. Key Social Cognitive Theory variables were targeted and operationalised, including self-efficacy, outcome expectations, self-monitoring, goal setting, perceived facilitators

and barriers to changes, role modelling and social support. Sessions that included the child included practical fitness and fun activities. The primary outcome was fathers' weight. However, fathers and their children were assessed at baseline, and at 3- and 6-month follow-up, for weight, waist circumference, BMI, blood pressure, resting heart rate, objectively measured physical activity and self-reported dietary intake.

The experimental group fathers lost more weight (-7.6 kg; 95% CI -9.2, -6.0; $d = 0.54$) than control group fathers (0.0 kg; 95% CI -1.4, 1.6). In children, significant treatment effects ($p < 0.05$) were found for physical activity ($d = 0.74$), resting heart rate ($d = 0.51$) and dietary intake ($d = 0.84$). Morgan et al. (2011) concluded that the program, targeting fathers, resulted in significant weight loss and improved health-related outcomes in fathers and improved eating and physical activity among children.

Reviewer's notes: Although this study design did not set out to test the 'buddy' versus 'no buddy' question directly, conceptually, the father-child dyad was the key component of the intervention both practically and conceptually/theoretically, as compared to the 'non buddy'/no intervention control group. This interaction is further evidenced by the significant changes in outcome(s) for both father and child. The intervention did involve purposely pairing two individuals and specifically incorporating social support in a form of buddy-system. In this intervention the subject (father) is purposely supported by a 'natural pairing' within the family unit

and the social support was intended to operate in both directions via modelling. The intervention could equally be conceptualised as a *child* or *father* intervention although it is described here as targeting fathers' weight with the inclusion of the significant other (the child) being an adjunct or component within a multi-component intervention. The results detail clinical outcomes that are important for the fathers' and children's health.

Cholewa et al. (2008b) implemented a non-randomised pre-and-post trial to evaluate the effectiveness of a buddy system, record-keeping log, or both for increasing university students' physical activity. Participants were assigned to their preferred arm of the study. The participants attended one information session tailored for their assigned intervention arm. In the buddy-group, two same-sex individuals were paired using a five-level matching system and they worked together to increase their physical activity. In the combined-group, a commercial, password protected on-line logbook was added to be utilised by the participants to track their activity frequency, duration, goals, and progress. The primary outcome was self-reported physical activity. Measures were repeated at weeks five, eight and nine weeks and were sent and returned electronically.

At baseline, 49 per cent of participants were active compared to 68.6 per cent post-intervention. A positive and significant effect in activity status over time existed for the combination arm of the study ($p < .05$) effect size $d = 0.04$ (small). A positive and significant effect in activity status over

time existed for the recordkeeping device, ($p < .05$) effect size $d = 0.52$ (large). However, the buddy system intervention, on its own, did not appear to be impactful. The effect sizes for the record-keeping device and the combination arms suggest that the buddy system did not enhance the combination arm; the success of both interventions appeared to be due to the record-keeping device. Cholewa et al. (2008) concluded that the buddy system should be modified and re-implemented in a randomised trial, specifically, by modifying the categories of the matching criteria and creating a system allowing participants to choose their own buddies.

Reviewer's notes: Despite the Authors' previous work indicating self-selection of buddies is preferred by participants, this was not done in this non-randomised trial. The trial used a very low level intervention essentially with no motivational or counselling element up-front. Also, no training was provided for the participants with regard to their mutual 'buddy role'. The authors stated that the intervention first needed to be evaluated in a method consistent with its true-to-life functioning, however, a randomised trial would be required to test the intervention further.

Fals-Stewart et al. (2006) randomised female alcoholic patients ($n=138$) into one of three equally intensive interventions in an outpatient programme for the treatment of alcohol use disorders. The experimental intervention added a buddy-system to the existing programme of 32 face-to-face sessions. Both partners attended the 12 Behavioural Couples'

Therapy (BCT) sessions together during which the non-substance-abusing partner was an active participant in the intervention. In the remaining 20 sessions, female patients participated in individual 12-step facilitation sessions for the treatment of alcoholism, which the non-substance-abusing male partners did not attend. The experimental intervention was compared to Individual-Based Treatment (IBT) where the patient received the first 12 sessions in a 12-step facilitation format and then the exact same session content as BCT for the remaining 20 sessions. The control group received a psycho-educational attention control treatment (PACT) for the 32 sessions. The primary outcome was percentage of days abstinent (PDA).

There were no significant differences between BCT and IBT or PACT in terms of PDA status at post-treatment, because all of the interventions were fairly effective in reducing reported drinking during treatment (most patients in all conditions reported abstinence or very low levels of drinking). However, during the 12-month follow-up, female patients in BCT increased their drinking at a significantly slower rate than female patients in IBT and PACT. Fals-Stewart et al. (2006) concluded that the results indicated that BCT (plus the individual alcoholism counselling common to all of the interventions) was significantly more effective in terms of improving outcomes along different dimensions of drinking behaviour and relationship adjustment than were the other treatment conditions. Fals-Stewart et al. (2006) point out that the positive outcomes that appeared to be associated with BCT are probably only achievable for

women seeking alcoholism treatment who are involved with *non*-substance-abusing partners. In situations where both partners misuse psychoactive substances, an intervention substantially different than BCT may be needed, perhaps incorporating motivational interviewing methods or contingency management.

Tevyaw et al. (2007) conducted a pilot study to evaluate whether incorporating a peer in a brief motivational intervention would lead to significant reductions in alcohol use and problems in students mandated to receive treatment after violating campus alcohol policy. Thirty-six participant-peer dyads (66% male) were randomly assigned to receive either two 45-min sessions of an individual motivational intervention (IMI, $n = 18$) or a peer-enhanced motivational intervention (PMI, $n = 18$). The peers were not specifically trained in their roles, however they were encouraged to help the participant to develop and implement strategies to reduce his or her drinking. The primary outcome was the number of drinking days and heavy drinking days at one-month follow-up and alcohol-related problems were also assessed by questionnaire. Effect sizes revealed that the magnitude of within-group reductions in alcohol use and problems were three times larger on average for the PMI group (average effect size $d = 0.68$) than for the IMI group (average effect size $d = 0.22$). Moderate between-group differences were observed for the number of drinking-days and alcohol-related problems (but not statistically different). Tevyaw et al. (2007) reported that the peers were willing to participate in

the intervention and that they were supportive of the participant during the process, and viewed the sessions as being effective. Tevyaw et al. (2007) concluded that findings suggest that including peers in BMIs may be an effective way to facilitate drinking reductions in mandated students who have already begun to demonstrate negative consequences from their drinking.

Keogh et al. (2011) investigated the effectiveness of a psychological, family-based intervention to improve diabetes-related outcomes in patients with poorly controlled type-2 diabetes. Patients were included in the 6-month prospective randomised trial if they had type-2 diabetes for more than 1-year and had persistently poor glycaemic control (HbA1c 8.0% or higher). The experimental group patients received their usual care plus three weekly sessions (45 minutes each) delivered by a health psychologist. The first two sessions took place in the patient's home with their family member (buddy). The third session involved a 10 to 15-minute follow-up telephone call. The intervention used techniques from health psychology and motivational interviewing. Patients in the control group received usual care. The outcomes reported were glycaemic control, self-reported beliefs about diabetes, psychological well-being, diet, exercise, and family support.

At the six-month follow-up, the intervention group reported significantly lower mean HbA1c levels than the control group (8.4% [SD = 0.99%] vs

8.8% [SD = 1.36%]; $p = 0.04$). The intervention was most effective in those with the poorest control at baseline. Tevyaw et al. (2007) concluded that the psychological family-based intervention for patients with poorly controlled type-2 diabetes led to improvements in glycaemic control, diabetes perceptions, psychological well-being, self-management behaviours, and family support. However, both groups continued to have unacceptably high HbA1c levels at follow-up, with neither group achieving optimal glycaemic control targets.

Martire et al. (2007) conducted a randomised trial to determine whether a couple-oriented intervention for osteoarthritis (OA) was more efficacious than a patient-oriented intervention, and whether each intervention was more efficacious than usual medical care (across a range of patient and spouse outcomes). In total, 242 older adults with OA and their spouses were randomly assigned to one of the three groups. The Couple-oriented education and support protocol (CES, $n = 99$) was a group education and support intervention comprising six weekly 2-hour sessions (the 'Arthritis Self-Management Program') delivered by staff of the Arthritis Foundation, and previously shown to successfully reduce pain severity and depressive symptomatology and to enhance a sense of efficacy in managing arthritis pain and other symptoms. These sessions were attended by participants and their spouses and topics were framed as couples' issues whenever possible. Spouses were directly trained in being supportive. Participants in the patient-oriented programme (PES, $n = 89$) received the same intervention

as above, however no spouses, family members, or friends participated in sessions. Five monthly booster sessions were conducted via telephone over the six-month interim between the end of each intervention and the final follow-up assessment to review patients' and spouses' progress in meeting goals that were set during the intervention sessions. The remaining 54 participants received usual medical care.

Intent-to-treat analyses indicated no significant differences between the three study conditions in outcomes for individuals with OA or their spouses. However, approximately 30% of the couples had dropped out of the study by the six-month follow-up. A per-protocol analyses of 'completers' showed that at the six-month follow-up, contrary to prediction, individuals with OA who received the patient-oriented intervention reported greater reductions in pain and improvements in physical function than those who received the couple-oriented intervention. Martire et al. (2007) concluded that a couples approach to education and support for OA may offer no advantage for individuals with OA but may prove helpful for spouses, thereby indirectly benefiting individuals with OA over time.

4.16 Results summary

4.16.1 Body of evidence

In an effort to illustrate the entire body of evidence directly relevant to the current review, Table 10 summarises the included evidence in accordance with the NHMRC guidelines. This summary table is intended to provide a

quick reference to the included studies and, in particular, a quick guide to the clinical relevance of the results. Only data for the primary (patient-centred) outcomes are summarised. Results that relate to secondary outcomes or to the nature of the social-support relationship, or to the supporter, are not included here. The summary characteristics also include the author, country, intervention type, the level and quality of evidence. In some cases, the clinically relevant effect is noted as mixed and this indicates that of the outcomes measured, some demonstrated statistically significant beneficial effects while others did not or that statistically significant beneficial effects were seen at some time-points but perhaps not at others. More detailed results are provided in the data extraction tables in **Appendix** . The evidence presented in this review is derived from a range of studies representing predominantly medium to high levels of evidence.

Table 10: Body of evidence– effectiveness of interventions

Study	Country	Intervention	Strength of evidence				Clinically relevant effect?
			Comparison	Level of evidence	Quality	Statistical precision	
Achtenberg (2011)	The Netherlands	All behaviour change techniques	Usual care & head-to-head	Level-I review of reviews	High		✓mixed
Heath (2012)	USA	All physical activity interventions to increase physical activity	Usual care & head-to-head	Level-I review of reviews and meta-analysis	High		✓mixed
Conn (2011)	USA	All physical activity interventions to increase physical activity in healthy adults (only)	Usual care & head-to-head	Level-I review and meta-analysis	High		✓mixed
Park (2012)	South Korea/USA	All buddy-systems interventions for smoking cessation	Usual care	Level-I review and meta-analysis	High		✖
May (2000)	UK	All buddy-systems interventions for smoking cessation	Usual care	Level-I review	High		✓mostly
Albrecht (2006)	USA	Buddy intervention for pregnant adolescents smoking cessation	Head-to-head without buddy	Level II RCT	Good	p=0.01 @ 8-weeks. n/s at 12-months	✓mixed
May (2006)	UK	Buddy intervention for smoking cessation	Head-to-head without buddy	Level II RCT	Good	n/s	✖
Donatelle (2000)	USA	Buddy intervention and financial incentives for smoking cessation	Head-to-head without buddy	Level II RCT	Good-minus	p=0.0001	✓
West (1998)	UK	Buddy intervention for smoking cessation in general practice	Head-to-head without buddy	Level II RCT	Good	p=0.01	✓

Table 10: Body of evidence– effectiveness of interventions (continued)

Study	Country	Intervention	Comparison	Level of evidence	Quality	Statistical precision	Effective
Gruder (1993)	USA	Buddy intervention for smoking cessation self-help	Four-group head-to-head	Level II Cluster-RCT	Good	p < 0.03	✓
Hennrikus (2010)	USA	Buddy intervention for pregnant smokers	Head-to-head without buddy	Level III RCT	Good	n/s pilot study not powered between-group diff.	✓ unclear
Gulliver (2004)	USA	Buddy intervention for pregnant smokers and financial incentives for cessation	Head-to-head without buddy	Level III-1 RCT	Fair	p < 0.05	✓
Carlson (2002)	Canada	Buddy intervention for smoking cessation in large scale programme	Head-to-head without buddy	Level III-2 non-R	Good	p<0.05 @ 12-month	✓
Morgan (2011)	Australia	Buddy intervention for overweight Fathers	Wait-list control	Level II RCT	Good	p<0.05	✓
Cholewa (2008)	Canada	Buddy-system to promote physical activity for university students	Head-to-head three group	Level III-3 before-and-after	Fair	n/s	✖
Fals-Stewart (2006)	USA	Buddy-system to promote abstinence form alcohol for alcoholic females	Head-to-head without buddy	Level II RCT	Good	p<0.05 on 12-month relapse	✓
Tevyaw (2007)	USA	Buddy-system to promote abstinence form alcohol for university students	Head-to-head without buddy	II/III-1 (small sample RCT)	Fair	n/s pilot study not powered between-group diff.	✓ unclear
Keogh (2011)	Ireland	Buddy-system for poorly controlled type-2 diabetes	Usual care	Level II RCT	Good	p=0.04	✓
Martire (2007)	USA	Buddy-system for self-management of osteoarthritis	Usual care	Level II RCT	Fair		unclear

4.16.2 Summary of key findings

Effectiveness: Broadly, the results were encouraging and some studies did demonstrate a statistically significant incremental effect (on primary outcomes) when adding a support-buddy to an existing programme, however some did not. In addition, many studies demonstrated improvements in secondary psychosocial outcomes that may bring health benefits to both participants and their supporters over time. However, most studies were of too short duration to detect these effects and/or had insufficient power to do so if such effects were present.

As most research has been conducted in the context of smoking cessation, it is not known how or to what degree these findings generalise to other behaviour change situations in other populations. It does appear that there are differences between stopping behaviours and adopting/maintaining behaviours and how this plays out with respect to the support provided by a buddy is not known. For example, support-buddies in weight-loss or physical activity interventions might be needed for support for extended periods of time (months or years) and this level of commitment may simply be too much to reasonably expect from most volunteers.

With respect to physical activity in particular, Heath and Parra et al. (2012) reported that, in general, these initiatives to increase social support can effectively promote physical activity. In general, the authors reported effect sizes for interventions delivered in populations with established disease

(e.g. obese populations) to be notably higher ($d = 0.44$) than those reported for healthy adult populations overall ($d = 0.19$). The presence of chronic illness may cause patients to be more responsive to motivational interventions but healthy people less so. This highlights a concerning prevention versus cure paradox for physical activity promotion in particular, whereby the benefits of increased physical activity are almost a 'gift' at the individual level, but at the system level the benefits require great effort for relatively little return (and the opportunity costs are seldom full appreciated or quantified).

The nature of support relationship: With regard to smoking cessation, the context in which most research has been conducted, most programmes have attempted to influence pre-existing supportive relationships, often with a spouse. Other approaches have been used including multi-level matching (Cholewa & Irwin, 2008b) and creating new ties (West, et al., 1998) but with mixed results. The majority of studies of smoking cessation assess partner support supplemental to an established cessation intervention and there may be a 'ceiling effect', whereby established treatments given to both the intervention and control groups may have already adequately met smokers' support needs (Park, et al., 2012). May and West (2000; 2006) comment extensively on the nature of the relationship. May and West (2000) found that interventions involving new ties (common adversity) and interventions using existing ones can be effective and both offer the opportunity to provide buddies with various levels of training. However,

the latter (existing ties) involves attempting to develop or change an established (typically intimate) relationship. May and West (2000) assert that other behavioural research suggests that these relationships can be very resistant to change. Further, Park et al. (2012) concur that while the studies do suggest that partner support and the absence of partner criticism may be important in smoking cessation, these behaviours are unlikely to have been changed significantly by the interventions used in these types of studies.

May and West (2006) do propose some possibilities for increasing the strength of the buddying intervention including: (1) firmer guidance/training (2) a more rigorous protocol for establishing a (new) relationship between members of buddy pairs who have lost a partner. Most of the authors concluded that this type of buddy system may not add substantially to the success rates in smoking cessation group based treatment programmes, where the level of support is already high: but this need not be the case within individual treatment or self-help programmes or programmes conducted in the context of different health behaviours.

Finally, Fals-Stewart et al. (2006) studied women seeking alcoholism treatment and achieved positive results with a programme involving participant's non-substance-abusing partners. The authors signalled that similar outcomes are probably not achievable for women seeking alcoholism treatment who are involved with a partner who is substance-

abusing. Thus the potential benefits of 'common-adversity' may not be universal across different contexts.

Training: Studies differed markedly in their approach to buddy training. Some programmes essentially left participants to their own devices (Albrecht, et al., 2006; May, West, Hajek, McEwen, & McRobbie, 2006b; West, et al., 1998), some provided guidance and reference/training materials (Donatelle, et al., 2000; Gruder, et al., 1993) and a few provided very intensive specialised one-on-one or group training aimed to enhance supporter's effectiveness (Carlson, et al., 2002; Fals-Stewart, et al., 2006; Hennrikus, et al., 2010). In the study by Hennrikus et al. (2010), the focus was almost exclusively on delivering intensive training to the buddy, but the results were unclear. While intuitively it might seem that more training should result in better outcomes, it was not possible to draw this conclusion from the studies reviewed mainly because of a general lack of evaluation. Future studies need to specifically set out to evaluate the incremental effectiveness of buddy training. Moreover, it would be helpful to know when training has been effective and when it has not, so that the overall fidelity of an intervention can be considered in the context of the overall results. Achterberg et al. (2011) point out that if knowledge (only) techniques are not particularly effective with patients generally (Conn, et al., 2011), then it is likely that they may not be particularly effective with buddies either, and that training needs to be evidence-based, measurable, and feasibly 'deliverable' in real world settings. Researcher delivered

intervention components and training have been shown to be considerably more effective than train-the-trainer programmes (Conn, et al., 2011), therefore more work is needed to design support-person training that can be delivered by non-research providers and which is cost-effective. It may be that 'less is more'.

In some cases, the researchers did identify possible training deficits. One example is the lack of specific relapse prevention training in smoking cessation programmes (Albrecht, et al., 2006), and it has been suggested that this could be responsible for a decline in intervention effect over time, however this relationship could not be confirmed for the available data. Generally, more training *could* have been provided to buddies but it is not known exactly how much is 'enough' and what level is potentially wasteful (given that scarce resources are also needed by the participant).

Achterberg et al. (2012) assert that health professionals should avoid the pitfall of thinking that providing knowledge, resource materials and professional support will be sufficient to assist patients to accomplish change and maintain new healthy behaviours over time. Achterberg et al. (2012) highlight the need for more creativity in the design and practical application of behaviour change interventions, including more creative and effective methods to increase social support (including providing training as just one way to enhance the quality of support).

Ostensibly, the type of buddy relationship, the context, and the type of training required all appear to be related. However, the structure of this relationship is not clearly defined in the literature. This 'match up' (buddy selection; new ties; non-intimate partners) or 'patch-up' (training; existing intimate ties) question remains unanswered. Gender differences may also exert influences on the outcomes in some contexts, but the small sample sizes in many of the studies reviewed made sub-group analyses unfeasible. Unintended consequences also received little attention in the studies reviewed, but May and West (2000) do flag the possibility of programme participants achieving more poorly once adjunct social supports come to an end.

There is also very little information on the possible positive health effects that might be *transmitted* to buddies. This is potentially a powerful intervention effect but one that is largely un-researched in this field. Such *ripple-effects* in health behaviours have been demonstrated in large networks (Christakis & Allison, 2006; Christakis & Fowler, 2007; Christakis & Fowler, 2008) but how to effectively and proactively harness these effects in individual level behaviour change interventions is largely unknown.

4.16.3 Limitations in primary research methodology

The need for time- and cost-effective lifestyle counselling and guided self-help approaches in health care is evident. The use of buddy-systems is a relatively simple, apparently acceptable, intuitive and potentially effective way to achieve improved health outcomes. However, these intervention types still require further development and a distilling and refining of the 'active ingredients' and of ways in which to identify and measure them. By nature, most programmes correctly employ multiple-component and/or multiple-risk factor intervention designs, and as a result, social support is often combined with other intervention approaches. While this multiple-component approach appears beneficial for programme effectiveness, it does make the study of social support and buddy-systems difficult as it limits the ability of researchers to accurately assess the separate effects of social support. Clarifying the mechanisms of action, and hence causality, is complicated. The need to control for known covariates (known life-style risk factors) is often in conflict with the fact that social support affects these covariates too, and controlling for these variables may reduce the discernible effects of social support. Further, psychosocial measures such as quality of life and patient satisfaction, are hard to quantify, but arguably, no less important than clinical measures morbidity and mortality and these outcomes should be considered also (Verheijden, et al., 2005).

4.16.4 Contextual limitations and implications

It is difficult to compare study contexts and settings exactly. Studies were selected on the basis that they reflected the New Zealand context/setting as much as possible: at the level of the participant-provider interaction. The interventions considered in this review were predominantly implemented in a smoking cessation context; therefore, the reader should judge generalisability with respect to other health behaviour-change contexts.

While questions of generalisability are applicable to all clinical trials, arguably, this may be more problematic when the intervention is ‘operator dependant’, that is, dependent (at least in part) on the attitudes, enthusiasm, competence and motivation of providers. Intensive strategies that entail multiple follow-up visits may make unrealistic demands on limited clinical time and may simply be impractical in typical New Zealand primary care settings. In the studies reviewed, there are very large differences in the intensity of the interventions. Some, by design, are minimal contact self-help type interventions while others involve multiple face-to-face contacts with trained practitioners and/or health professionals. As a consequence, the resource demands of the programmes reviewed vary greatly and cost-effectiveness considerations are therefore very relevant. The generalisability of findings to the New Zealand context should therefore be measured on a case-by-case basis and the potential cost-effectiveness should be considered carefully. Estimating resource utilisation and any

possible cost off-sets and/or savings to the health care system however, remains beyond the scope of this report.

4.17 Concluding comments

Clearly, there is value in determining ways to extend intervention contact by incorporating *intra-treatment* social support (support provided within treatment sessions and groups) as well as extra-treatment social support (on-going support provided outside of or following treatment sessions). Balanced against the need to study patient-centred outcomes, future studies are also needed that address the uncompromising question of whether or not socially-oriented lifestyle interventions can truly serve as a partial substitute for regular health-care? That is, studies of clinical outcomes that have a direct relation to health-care utilisation and therefore costs. The absolute measure of a life-style modification intervention is therefore 'efficiency': that is, people 'caring for themselves' at least to an increased degree, and caring for each other in pairs and groups and communities.

The literature reviewed suggests that social-support oriented life-style modification interventions merit future development and implementation in practical settings. When interpreting this finding, from a public health perspective, it is important to keep in mind that even small changes in behaviours might be potentially important when many people are affected.

The relative merits of directing resources towards buddy-training compared to helping participants select a 'better' buddy warrants further research, in

particular, how these interactions are similar or different across a range of behaviour change contexts. More knowledge is required to guide the implementation of cost-effective ways to maintain sustainable lifestyle contact and support over longer periods of time.

5 METHODS

5.1 Overview

5.1.1 Primary objective

The primary objective of the research project was to design, implement and assess the effects of a buddy-Motivational Interviewing intervention (buddy-MI) and pro-active email follow-up on assisting and supporting the adoption and maintenance of regular physical activity, in relatively physically inactive adults in stable health²¹, compared to an active control one-on-one Motivational Interviewing intervention (MI) and pro-active email follow-up, both delivered in a university community setting. Informed by a comprehensive review of the literature, the buddy-MI intervention is essentially an adaptation of MI (an established behaviour change counselling method) whereby a support person (motivational-buddy) is invited to adopt a partnership role in the change process. Essentially the trial was designed to test an experimental physical activity counselling intervention²² against usual-care physical activity counselling, *head-to-head*.

The primary outcomes of interest are total self-reported physical activity, cardiorespiratory fitness, and health related quality of life (HRQOL). Physical activity reflects the behavioural aims of the intervention and

²¹Stable health is used here to define the absence of a serious and progressing and/or unmanaged chronic condition or disease.

²² Buddy-Motivational Interviewing, an intervention with potential applicability for use in primary care and community settings

cardiorespiratory fitness reflects the down-stream physiological adaptations that may potentially lead to significant health benefits. HRQOL reflects the psychological aims of the intervention as the HRQOL construct includes the domains role-emotional; vitality; social function; and mental health. The concept of HRQOL acknowledges that people 'rate' their actual situation in relation to their individual expectations. A number of secondary outcomes are also of interest, in that they may inform the debate around the necessary and sufficient conditions of physical activity behaviour change within the context of MI delivered in community settings.

5.1.2 Specific study aims

Key aims of the study included testing the practical feasibility and value of formally involving a social support person (the buddy) in the physical activity counselling and support process. The focus was on assisting relatively sedentary adult participants to adopt regular physical exercise²³ for the purpose of improving their cardio-respiratory fitness, health, and health-related quality of life²⁴. The feasibility of implementing the intervention and evaluating the incremental effect of the buddy system, in this context, were the dual foci of the enquiry. The intervention specifically aimed to empower people in developing on-going intrinsic motivation, self-

²³ For example, 30 minutes of moderate intensity physical exercise three-five days per week.

²⁴ Health-related quality of life (HRQOL) (a sub-measure of Quality of Life) is a purely subjective measure, usually assessed via validated patient-rated questionnaires (e.g. the SF-36v2). HRQOL is a concept that tries to embrace peoples' subjective judgements of their level of health or health status, across multiple domains including: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems and mental health (Ware & Sherbourne, 1992).

management skills, and increased commitment to physical activity – lasting beyond the intervention contact period. In other words, the study aimed to demonstrate a synergy between Motivational Interviewing and a buddy-system that is effective over time. A parallel aim was to deliver the buddy-MI intervention in a format that could potentially reduce resource utilisation and be realistically implemented within typical primary care, workplace, school and other similar settings²⁵. Broadly, the buddy-MI intervention involves a collaborative, person-centred form of guiding a person to elicit and strengthen their own motivation for change.

5.1.3 Study design/overview

A quantitative research method was used, based on a randomised controlled trial (RCT), the *gold standard* in experimental designs (Jadad, et al., 1996). The pragmatic²⁶, parallel group RCT incorporated block randomisation²⁷, using the opaque sealed envelope technique (Roberts & Torgerson, 1998). The RCT was preceded by a comprehensive pilot-study using a non-randomised two-group design (n=16). The pilot study focused on refining

²⁵ Settings considered similar are those in which a suitable organisational structure exists, for example workplaces, schools and universities, church groups, clubs, and a range of health-care settings. Health-care settings could include inpatient and outpatient clinics (e.g. diabetes centres, cardiac rehabilitation clinics, weight management clinics) and also GP based clinics, Māori health-care settings and Integrated Family Health Centres (IFHCs).

²⁶ Pragmatic RCTs tend to reflect the heterogeneity of participants within the particular context, minimise exclusion criteria, define participants by presentation rather than diagnosis, and tend not be blinded, but carefully conceal allocation during randomisation.

²⁷ In large studies simple randomisation will on average allocate equal numbers to each arm, however in small trials simple randomisation can result in groups of different sizes resulting in reduced precision of estimates of effect. Block randomisation guarantees that at no time will the imbalance be large. Using blocks of four, there are six sequences to which participants can be allocated to the experimental (E) or control interventions (C): EECC, ECEC, ECCE, CEEC, CECE, and CCEE. One of the six arrangements was selected randomly and then four participants assigned accordingly. This process was repeated as many times as it was needed for the required sample size (see Roberts & Torgerson, 1998).

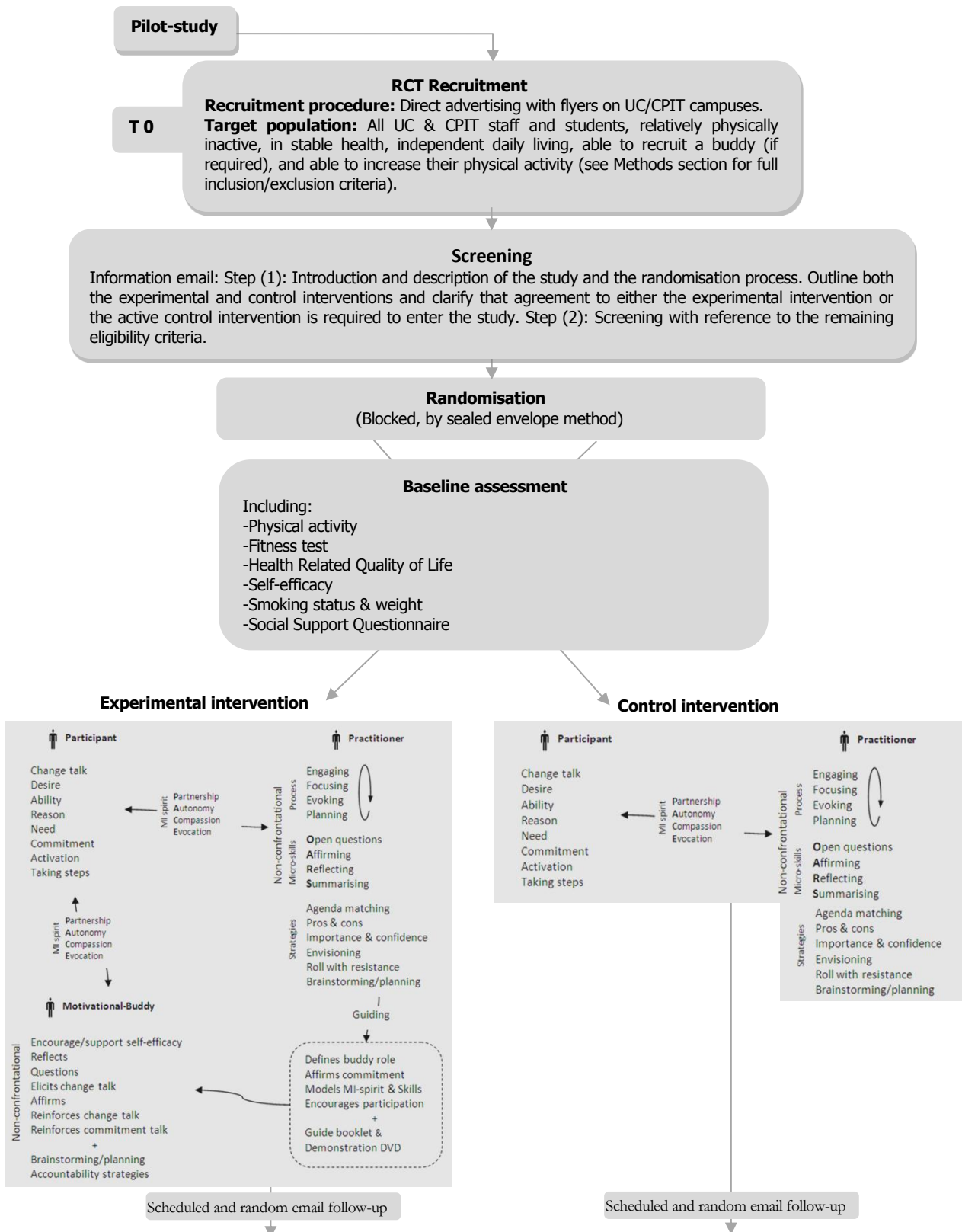
and testing the feasibility of the intervention and on evaluating process outcomes (see page 170 for a full description of the pilot phase).

Group allocation was via a two-step consent process. Participants were recruited via advertising flyers placed on the University of Canterbury campus (later expanded to the CPIT campus) and via other opportunistic recruitment. Individuals who responded to the recruitment flyers were initially provided with detailed participant information via return email and those who remained interested were screened for inclusion/exclusion criteria (described in full on p. 164) including the willingness and ability to engage a motivational-buddy if required. The difference between the two interventions was fully explained to potential participants and there was no deception or withholding of information. Participants were not formally entered in the trial or randomised until they had re-confirmed that they understood that there was an equal probability of being allocated to either intervention group. This two-step process served to minimise self-selection bias making it more difficult to bias the overall results intentionally or unintentionally and so strengthen the credibility of the study conclusions (Day & Altman, 2000). In addition, an *intention-to-treat* analysis was used (in this scenario, the intervention effect will tend to be oriented towards the *null* reducing the chance of a type-I error).

Using the above design, the study assessed the effectiveness of the 12-month physical activity counselling intervention incorporating buddy-

Motivational Interviewing and pro-active email follow-up, compared to a physical activity counselling intervention incorporating Motivational Interviewing and pro-active email follow-up delivered one-to-one (see the study flowchart, **Figure 11** p. 158).

Study flowchart



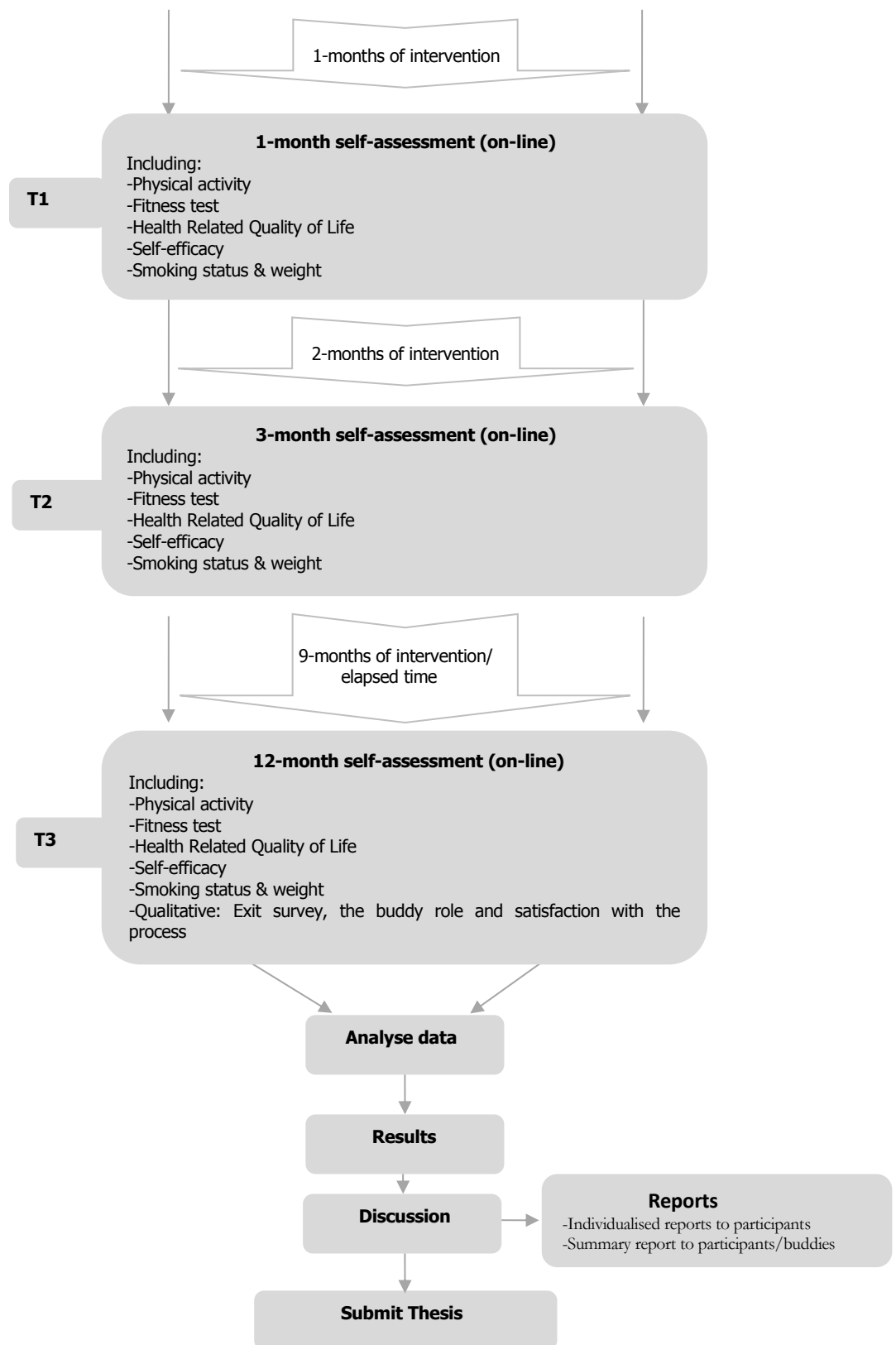


Figure 11: Study flowchart (continued)

5.2 Research questions

5.2.1 Self-report physical activity

Is a 12-month buddy-Motivational Interviewing intervention (buddy-MI) with pro-active email follow-up effective for supporting the adoption and maintenance of regular physical activity (according to international guidelines, and measured one, three and 12-months)²⁸ in relatively physically inactive adults (low levels of physical exercise), in stable health, aged ≥ 17 years: compared to an *active control* one-on-one Motivational Interviewing intervention with pro-active email follow-up, both delivered in a university community setting?

5.2.2 Cardio-respiratory fitness

Is a 12-month buddy-Motivational Interviewing intervention (buddy-MI) with pro-active email follow-up effective in increasing the cardio-respiratory fitness of relatively physically inactive adults (low levels of physical exercise), in stable health, aged ≥ 17 years, measured at one, three and 12-months: compared to an *active control* one-on-one Motivational Interviewing intervention with pro-active email follow-up, both delivered in a university community setting?

²⁸Increasing physical activity towards/or meeting or exceeding current international recommendations, for reasons related to physical and/or mental health.

5.2.3 *Self-reported quality of life*

Is a 12-month buddy-Motivational Interviewing intervention (buddy-MI) with pro-active email follow-up effective in improving the self-reported health-related quality of life (HRQOL) of relatively physically inactive adults (low levels of physical exercise), in stable health, aged ≥ 17 years, measured at one, three and 12-months: compared to an *active control* one-on-one Motivational Interviewing intervention with pro-active email follow-up, both delivered in a university community setting?

5.2.4 *Self-efficacy*

Is a 12-month buddy-Motivational Interviewing intervention (buddy-MI) with pro-active email follow-up effective in significantly increasing the global and exercise-specific self-efficacy of relatively physically inactive adults (low levels of physical exercise), in stable health, aged ≥ 17 years, measured at baseline and 12-months post-intervention: compared to an *active control* one-on-one Motivational Interviewing intervention with pro-active email follow-up, both delivered in a university community setting?

5.2.5 *Exercise stages of change*

Is a 12-month buddy-Motivational Interviewing intervention (buddy-MI) with pro-active email follow-up effective in progressing participants' 'readiness for change' as described by (Prochaska & DiClemente, 1982)²⁹:

²⁹ The stages are numbered from one (pre-contemplation) to five (maintenance). As described by Rossi (2000), the simplest approach to conceptualizing stage progression is to count the number of stages progressed as the outcome.

compared to an *active control* one-on-one Motivational Interviewing intervention with pro-active email follow-up, both delivered in a university community setting?

5.2.6 Social support

Is social support (i.e. emotional and tangible support) related to participants' health outcomes, in a 12-month Motivational Interviewing intervention physical activity promotion trial (buddy-MI and one-on-one MI) delivered in a university community setting?

5.2.7 Treatment satisfaction

What was the participants' subjective experience of the intervention programme overall (control and experimental participants)? In addition, for the experimental group only, what aspects of the motivational-buddy relationship were useful/less useful and how did participants rate the feasibility and practicality of the model?

5.3 Outcomes: overview

The following list briefly outlines the primary and secondary study outcomes. Full descriptions of the outcome measures/instruments are provided beginning on page 199.

5.3.1 Primary outcomes

- Physical activity
- Cardio-respiratory fitness
- Health related quality of life

5.3.2 Secondary outcomes

- Self-efficacy/exercise self-efficacy
- Exercise stage of change
- Participant satisfaction with the buddy relationship
- Participant satisfaction with the programme
- Treatment fidelity
- Buddy empathy (experimental group)

5.3.3 Demographics & bio-measures

- Age
- Gender
- Smoking status
- Ethnicity
- Height
- Weight
- BMI
- Social support

5.4 Study hypothesis

It is hypothesised that experimental group participants will increase their daily physical activity levels in the course of one year of intervention, and attain and maintain significant increases in cardio-respiratory fitness compared to standard care (active control) participants at 12-month follow-up. Also, it is hypothesised that experimental group participants will self-report improved health-related quality of life and report higher global and exercise specific self-efficacy. Implicit in this hypothesis was the requirement to successfully implement the experimental intervention in a technically correct, practical and acceptable way.

5.5 The host institution

The Health Sciences Centre, University of Canterbury www.hsci.canterbury.ac.nz was established in 2004 to develop postgraduate programmes and associated research activities in the health sciences. The Centre fosters health related interdisciplinary and collaborative initiatives within the University, with other tertiary education providers in Canterbury and beyond, and with the health sector. The Health Sciences Centre has undergraduate courses and postgraduate programmes and research activities that respond to the dynamic nature of the health sector and its workforce. Currently, approximately 250 students are enrolled in Health Sciences courses and the centre has an enthusiastic cohort of PhD students working predominantly in fields of prevention and health promotion. Since moving to a newly refurbished building in 2009, the Health Sciences Centre now has a state-of-the-art clinic facility, complete with audio visual recording and one-way observational facilities. This purpose built clinic is especially suited for teaching, counselling, assessment and other behaviour-change/psychological intervention programmes. The clinic was the facility used for the delivery of the intervention MI sessions.

5.5.1 Enrolled participants

Inclusion criteria: volunteer adults (n=60) (students or staff of the University of Canterbury or Christchurch Polytechnic Institute of

Technology) aged ≥ 17 years, relatively physically inactive (i.e. the lack of a regular pattern of physical activity on most days)³⁰, in stable health³¹, able to read and write English, independent and able to attend scheduled clinic/counselling sessions, able to enlist the involvement of a motivational-buddy, and able to increase their physical activity. In total 60 participants entered the study. To be eligible for inclusion in the study, potential participants had to be able and willing to consent to randomisation into either the experimental group or the active control group. The difference between the groups was explained to potential participants, that is, there was no deception or withholding of information. This required all potential participants to be confident that they could recruit a buddy if they were to be randomly assigned to the experimental group.

Exclusion criteria: failing to meet all inclusion criteria, and/or people with unstable health, coronary heart disease or ischemia or other diagnosed cardiac conditions, type-I diabetes,³² other diagnosed conditions for which physical activity is contraindicated. In addition, people who had been advised not to exercise by a health-care professional, or people who failed

³⁰Pre-assessment screening for participants' levels of physical activity was achieved by asking participants if they meet the criteria "half an hour of at least moderate-intensity physical activity on most days", the former being the leisure-time-based physical activity population health recommendation, and a quick guide to overall physical activity levels. If a potential participant did not meet this criterion, then the IPAQ category *low* was assumed and the potential participant could then progress on to complete the full IPAQ questionnaire.

³¹Stable health is used here to define the absence of a serious and progressing and/or unmanaged chronic condition/disease. Overweight or obesity or type 2-diabetes were not necessarily reasons for exclusion.

³²For people with type-1 diabetes, the optimal management of blood glucose levels when introducing physical activity can be complex and can require expert supervision that was beyond the scope and resources of this study.

the physical exercise risk assessment criteria as per the Physical Activity Readiness Questionnaire (**Appendix A**).

5.5.2 *Non-enrolled motivational-buddies*

Participants self-selected their buddies from their peer group³³. Buddies had to be able and willing to attend scheduled clinic/counselling sessions with the participant and be able and willing to commit to being involved with and supporting the participant in the change process. Buddies may or may not have been currently physically active at the time of recruitment nor were required to adopt any particular exercise behaviour. The volunteer buddies were not formally enrolled in the study, although they were required to consent to participation in their support role.

Exclusion criteria: Buddies could not be enrolled concurrently as participants (i.e. two people could not be both individually enrolled participants in the study and be concurrently enrolled as motivational-buddies).

5.6 *Recruitment*

Routes for recruitment (participants) included direct email recruitment from student groups, and other opportunistic recruitment (e.g. word-of-mouth referrals and flyer drops). Participants were selected serially (i.e. consecutive students or staff who responded positively to the invitation

³³In a recent pilot study of an exercise buddy intervention (Scott & Irwin, 2008), the researchers strongly recommended participant-selected exercise buddies (family or peers) as opposed to *assigned* buddies (strangers).

flyer or email) from those who meet the inclusion/exclusion criteria. Refusals were substituted by the next eligible participant until the recruitment period ended (when 60 participants had been enrolled in the study).

5.7 Experimental intervention background and rationale

Motivational Interviewing (MI) involves the conscious, disciplined and flexible use of specific communication principles and strategies to evoke a person's own motivations for change. Emphasis is given to the underlying spirit of MI which can be summarised as partnership (an even power relationship and a joint decision making process), autonomy (honouring client autonomy/detachment from outcome), compassion (unconditional positive regard) and evocation (the process of bringing to mind and harnessing what people already have) (Miller, 2010; Miller & Rollnick, 2002; Miller & Rose, 2009). MI involves a number of micro-skills including open questions, affirming, reflecting and summarising (OARS) within an overarching process of engaging, focusing, evoking and planning and this process can be tailored depending of the needs of the client and the context (Miller, 2010; Miller & Rollnick, 2002). An MI therapist can also use a range of strategies including agenda-matching, pros-and-cons, importance and confidence scaling questions, envisioning, rolling with resistance, brainstorming and planning. Another important therapist skill is the ability to resist the righting reflex: the impulse to adopt the expert role

and forge ahead of the client in an effort to fix the problem (Miller & Rollnick, 2002).

Motivational interviewing differs from traditional counselling with regard to the guiding style of interaction: in addition the development of discrepancy, supporting self-efficacy, the expression of empathy, empowerment, and encouraging hope and optimism are also components of good MI practice. MI has the potential to facilitate long-term exercise behaviour change and positively influence peoples' health, however as Miller & Rollnick (2009) point out, "If someone genuinely has no inherent motivation for making a change, MI cannot manufacture it" (p.131).

Motivational Interviewing, as interpreted and adapted here, formed the basis of the buddy-MI intervention model. In buddy-MI the therapist primarily delivers MI but also works with the participant (client) and his/her motivational-buddy to build a therapeutic relationship in which different basic elements of social exchange such as support, reciprocity, accountability and role-modelling may occur and can potentially be channelled to positive effect.

Generally, the focus of the motivational interviewing sessions is on engaging the participant and the motivational-buddy in discussions about change, exploring ambivalence about exercise habits, eliciting change talk and commitment language, and planning and discussing how behavioural changes might fit an individual's vision for the future and their personal

values. **Figure 12** illustrates the basic concept draft or starting point for the development of the buddy-MI intervention during the pilot phase (and **Figure 13**, p. 180 illustrates the final buddy-MI schematic in its evolved form). An additional component of the intervention is providing the buddy with informational/training resources that include background information on the study and that describe the buddy-role and what might be expected in terms of participation and commitment. These training resources were developed alongside the *in-session* intervention components and their development and testing is discussed fully in the pilot study section (p.181).



Figure 12: Schematic of the basic concept draft or starting point for the development of the buddy-MI intervention

Adapted from Miller and Rollnick (2002), Miller (2010) and other related materials.

5.8 Pilot testing and refinement of the intervention

The basic idea of the buddy-system is simple; however, exactly how MI and the buddy-system might combine in the context of physical activity counselling was relatively undeveloped and untested at the beginning of the research project. The pilot study was preceded by preliminary work with volunteers (colleagues and acquaintances) in which role-plays were used to test the basic idea and feasibility of the buddy-MI method. Following this pre-pilot work, a full pilot study was undertaken with 'real' clients to test and further refine the intervention and to record baseline treatment fidelity variables³⁴. The pilot study involved 16 participants (18 interviews in total) and focused on process rather than behaviour-change outcomes. Phase-one of the non-randomised pilot study involved eight volunteers recruited to participate in the active control group: usual-care Motivational Interviewing (MI). Phase-two of the pilot involved eight volunteers recruited to participate in the experimental intervention group: buddy-Motivational Interviewing (buddy-MI). For the pilot study, the eligibility criteria were broad; including both University of Canterbury staff and students of any age and the target behaviour (or behavioural issue) was unrestricted. The researcher/practitioner conducted the MI sessions which were video recorded and subsequently reviewed, coded and scored against various quality measures (discussed below, p. 172). In addition, the clinical-supervisor conducted four sessions of buddy-MI for the purpose of

³⁴ The fidelity strategies employed here and later in the RCT were guided by 'The Behavioral Change Consortium developed model (Resnick et al., (2005)).

skill demonstration, coding and review. The researcher and supervisor attended a 3-day Motivational Interviewing coding training workshop to further develop coding skills and to 'calibrate' coding thresholds to improve inter-rater reliability. Participant feedback was collated and added to the information obtained from the video reviews to guide on-going refinement of the intervention.

Starting with the draft schematic for the buddy-MI intervention (**Figure 12** above), five main tasks needed to be undertaken during the pilot study phase. These tasks included (1) up-skilling the practitioner in the delivery of quality MI therapy and (2) measuring competency (treatment fidelity) in MI generally, and then testing the feasibility and fidelity of the (still developing) buddy-MI method, (3) further defining and testing the buddy role, (4) trialling different approaches to training buddies in their defined role, (5) developing and evaluating different adaptations of standard MI therapeutic strategies (intended to enhance buddy engagement and contribute to the therapeutic effect). These five tasks are described in detail below.

5.8.1 Therapist training

Task (1) included practicing buddy-MI with 'real clients' and developing a written training guideline (**Appendix C**). The training guideline included sections on MI fundamentals, micro-skills and practice scenarios. While there was no intention to 'manualise' the intervention per se, the training

guideline was developed to aid good MI practice generally and more specifically the guideline served as a way of developing and operationalising the buddy *adaptation* of MI in the early stages. The training manual draws heavily on the work of Miller and Rollnick (2002), Manuel, et al. (2011), and on similar training manuals by Miller, Zweben, DiClemente and Rychtarik (1992), Apodaca and Gogineni et al. (2007b) and the *Motivational Interviewing with Significant Others Coding Manual* (Apodaca, Manuel, Moyers, & Amrhein, 2007a).

5.8.2 *Treatment fidelity*

Task (2) focused on measuring therapist competency and treatment fidelity using the Motivational Interviewing Treatment Integrity (MITI 3.1.1) instrument (Moyers, Martin, Manuel, Miller, & Ernst, 2010) as per the standard recommended protocol for the review of recorded MI sessions. The MITI is an empirically-validated instrument intended to be used as a treatment integrity measure for clinical trials of motivational interviewing and also as a means of providing structured feedback in clinical supervision/coaching. In clinical trials, the MITI essentially answers the question "How much is this interaction like Motivational Interviewing?" The MITI has two components: the global scores and the behaviour counts. The global scores (a single number from a five-point scale) are intended to represent the rater's global impression or overall judgment about the therapist's performance during an interview in the following five dimensions: evocation, collaboration (partnership), autonomy/support,

direction, and empathy. Global scores are intended to capture the rater's overall impression of how well or poorly the interviewer meets the intent of the scale (for example how well or poorly the interviewer displays empathy or works collaboratively with the participant).

The behaviour counts record instances of particular interviewer behaviours (such as asking open questions, reflecting participant statements, affirming). These running tallies occur from the beginning of the segment being reviewed until the end of the segment and the behaviour counts are summed and the ratios of scores are compared to defined competency thresholds. Typically both the global scores and behaviour counts are assessed within a single pass of a 20-minute recording.

It is important to note that for the purpose of comparable (between-group) fidelity scoring, therapist utterances that reflect *buddy* utterances were not counted even when directed back to the participant. It was found that total therapist utterances ('talk time') and behaviour counts were often reduced depending on the level of contribution made by the buddy but the MITI behaviour count *ratios* tend to hold true as do the global scores. Significant volleys often occurred between the participant and the buddy and/or between the buddy and the therapist, but these are not captured by the MITI. Fidelity data (in particular between-group comparisons) were analysed and fed back to the therapist during supervision. **Table 11** shows the pilot-study fidelity scores based on 16 first-session interviews (and the

thresholds by which therapist competence is judged) and similar data were produced for the duration of the main study (see **Results**).

Table 11: Pilot study fidelity scores via the MITI 3.1.1 instrument and competency thresholds, n = 16 participants

Measure	Control group	Experimental group
Global clinician rating	4.3	4.2
Reflection to Question Ratio (R:Q)	2.1	2.2
Percent Open Questions (%OC)	78%	76%
Percent Complex Reflections (%CR)	77%	80%
Percent MI-Adherent (% MIA)	100%	100%

OQ = Open Question; CR = Complex Reflection; R:Q = Total Reflection to Question ratio; %CR = the percentage of complex reflections out of the total number of reflections; %OC = the percentage of open questions out of the total number of all questions.

5.8.3 Development of the buddy-role

Task (3) focused on defining and operationalising the buddy-role and later the training materials including the instructional booklet and instructional/demonstration video. An important step in this process was defining the level of ‘motivational proficiency’ a buddy might reasonably attain. An initial review of early session recordings suggested that attempting to create a *buddy-therapist* proficient in MI was an unrealistic goal. Further, with respect to generalisability, doing so would most likely be outside the scope and resources of most potential real-world applications of buddy-MI. Therefore, developing a realistic motivational-buddy *role* that might practicably be achieved and that is motivationally consistent with MI principles *in-session* as well as being functional *out-of-session* was an important next step. The possibility for therapeutic buddy-participant

interactions to occur out-of-session is clearly an extension of traditional MI and is a focus for on-going development.

As a starting point to developing the role of the motivational-buddy, various definitions of *motivation* and *Motivational Interviewing* were considered and the following technical definitions were selected to guide and frame the process:

Motivation: “Brain activity that processes ‘input’ information about the internal state of the individual and external environment and determines behavioural ‘output’ ” (Dorman & Gaudiano, 1998),

and secondly,

Motivational Interviewing: “A collaborative goal oriented style of communication with particular attention to the language of change. It is designed to strengthen the individual’s motivation for and movement towards a specific goal by eliciting and exploring the persons own reasons for change within an atmosphere of acceptance and compassion” (Miller, 2011).

Next, along with information gained from the pre-pilot work, the following steps were undertaken:

- All recorded Motivational Interviewing sessions were coded with the MITI
- All buddy-MI sessions were also coded with the MISO (a *significant other* coding system)
- Participant responses were analysed
- Participant outcomes were sought by follow-up email (anecdotal/feedback)
- Feedback was sought from participants and buddies regarding their understanding and satisfaction with the process

- The effectiveness (process) of different MI adherent therapeutic strategies was rated by the researcher and the study supervisor (i.e. therapist initiated strategies intended to engage and assist the buddy in the task of evoking participant change-talk, for example scaling questions and envisioning).

Of particular interest were the different buddy communication elements observed and their influence on session dynamics and their relationship with participant change-talk. Participant change-talk (participant statements that indicate an inclination or reason for change) has been empirically identified as a proxy for behaviour change (Amrhein, Miller, Yahne, Palmer, & Fulcher, 2003).

Identifying and coding how buddies were interacting within sessions was an important step in refining the role and subsequently shaping buddy behaviour to be more motivationally consistent and thus more likely to evoke participant-change talk. The first analysis using the MITI (applied as it would be for a therapist) highlighted that the buddy utterances did not map well with the MITI categories and clearly buddy 'performance' did not approach or match that of an MI therapist (as suspected). Buddy contributions, however supportive, affirming and encouraging, were typically more observational rather than specifically reflecting participant utterances as would a MI therapist. Buddy utterances on the whole simply lacked sufficient specific behavioural elements to be called MI and did not include enough codeable utterances to approach MI therapist performance ratios (although the MI spirit could be detected and might approach competency threshold levels).

Having established what the buddy-role was *not* (i.e. not that of a proficient MI therapist), attention returned to investigating the buddy utterances that evoked participant change-talk such that they might be highlighted and further cultivated. Given that the MITI did not adequately capture buddy interactions, the Motivational Interviewing with Significant Others (MISO) instrument (Apodaca, et al., 2007b) was then used to capture the overall impression of the relationship between the buddy, the participant and the therapist.

The MISO coding system is designed specifically for coding the language of significant others (SO's, in this case motivational-buddies) who are participating in a session of Motivational Interviewing. Only SO speech is coded in this system and it is designed to be used with transcripts and audiotapes or videotapes of Motivational Interviewing sessions. The MISO is similar to the MITI in that it rates different domains of *performance* using global measures and specific behaviour counts. The global domains of *support*, *collaboration*, and *contemptuousness* are rated, and the ten behaviour counts *giving information general*, *giving information regarding the target behaviour*, *encourage/support*, *giving advice*, *discuss self*, *direct*, *confront*, *change talk*, *counter change talk*, and *follow/neutral* are summed to form ten separate behavioural scores. The relationship between certain buddy utterances and participant responses was investigated when these occurred. This relationship has previously been explored in a small study by Manuel, Houck, and Moyers, (2011) in the context of alcohol

counselling. Although the relationships are not fully understood, and robust correlations are yet to be determined, this work was used to guide the development of the buddy-role and in the design of the buddy training materials.

By combining all of the information gathered during the pilot phase with the above technical definitions (of motivation and Motivational Interviewing) and with reference to other previously published work (Apodaca & Longabaugh, 2009; Apodaca, et al., 2007a; Manuel, et al., 2011; Miller & Rollnick, 2002; Miller, et al., 1992; Rollnick, et al., 2008a) the following buddy-role definition was drafted to inform the on-going development of the intervention and the training materials:

Motivational-buddy: *A person who is an agent for change via the provision of social support within a motivational partnership: by striving to exert a positive influence in the direction of change both 'in session' (within structured Motivational Interviewing sessions) and 'out of session' (which comprises all other buddy-to-client interactions in day-to-day life). Support means actively trying to be of assistance to the client³⁵ in any way possible, including providing emotional support, feedback, help with tangible needs, and any other inputs of time, effort, or other material resources. An effective motivational-buddy demonstrates compassion and understanding, respects client autonomy, expresses unconditional positive regard, and is primarily invested in helping the client to explore his or her own reasons for change and helping the client to move toward, adopt and maintain a specific target behaviour.*

³⁵ The terms 'client' and 'participant' are sometimes used interchangeably. The term client is often used when describing a person engaged in treatment in a clinical context and participant is often used to describe a person involved in treatment within a research project.

Such a buddy might be thought of as a *motivationally-consistent-buddy* as compared to a skilled MI therapist and it can be seen from the above definition that the buddy-role is flexible and able to be adapted to suit the participant's needs, within the level of input and commitment that the buddy is able to provide.

Figure 13 shows the final version of the schematic for the buddy-MI intervention and, as presented, is limited to the *in-session* interactions. The actions of the motivational-buddy *outside* of the session time are not specified and can be determined entirely by the participant-buddy pair. Perhaps the most common understanding of the buddy system is that of one person teaming up with another to actually participate in an activity (e.g. walking/running buddy or a gym partner). However, by the above definition, the motivational-buddy may or may not happen to participate in any physical activity at all, as the relationship is first and foremost one of social support.

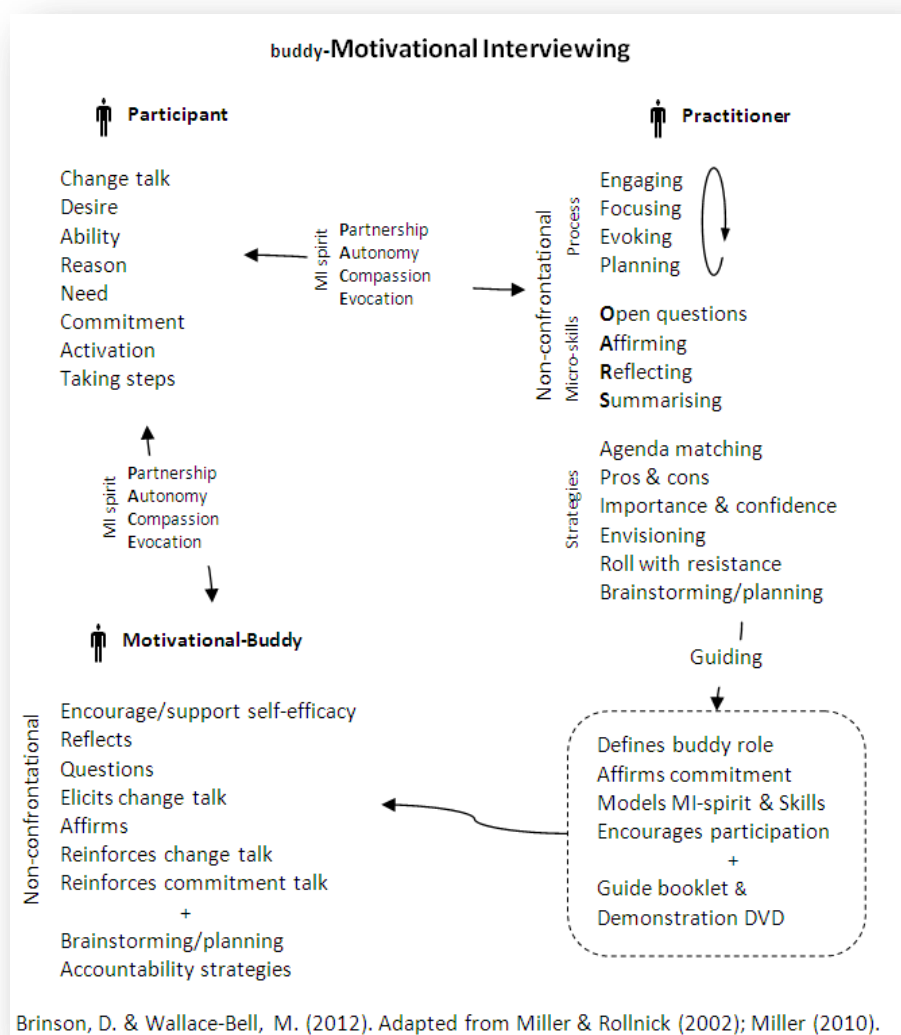


Figure 13: The final schematic for the buddy-MI intervention, representing the *in-session* interactions only

Given then that there were no set parameters within which the buddy pair was expected to fit, it was expected that there would be variability in buddy quality and performance. Therefore, developing training resources likely to enhance or 'level' buddy performance was the focus of the next task (task four).

5.8.4 *Developing the training resources*

Task (4) involved developing buddy training materials to attempt to enhance buddies' performance in their motivational role. As buddies were to be chosen by participants (*best choice* buddy) and not assigned by researchers, the buddy characteristics would not be *selectable* as such, and different buddies would likely vary in terms of their helpfulness and in the level of support they provide. At the lower end, a buddy might be motivationally neutral or perhaps even unhelpful. At the upper end, a buddy might be motivationally consistent with the MI *spirit*, skilled in reflective listening, evocation, affirmations and selective reinforcement, and generally display a collaborative and supportive style of interaction.

Therefore, seeking to enhance the buddies' skills in terms of communication style and desirable behaviours was very much within the scope of the intervention. To this end, training resources were produced including a printed booklet and specially produced instructional video (both explained in detail below). In addition, coaching buddies in real-time during the sessions via clinician *role-modelling* was also a focus and intrinsic to the intervention.

During the preliminary stages of the buddy-MI pilot, post-session feedback was sought from participating buddies. Buddies typically reported that they were unsure of exactly what their role was and what was expected of them. Initial attempts to briefly coach buddies in their role and in MI spirit and

micro skills prior to sessions proved unsuccessful, due to the lack of time to adequately cover the material. This pre-session coaching or ‘side-room chat’ aimed to quickly outline the style of communication that was desirable (e.g. non-confrontational/collaborative) and the Motivational Interviewing micro-skills of *open questions, affirmations, reflections, and summaries* (OARS). The brief coaching also aimed to encourage participation from the buddy: emphasising the preference for using a collaborative approach. Subsequent feedback from participants and their buddies quickly revealed that this method had two significant limitations. Firstly, the brief coaching did not provide sufficient time to adequately explain the principals of MI and it provided no opportunity for the buddy to observe or practice the micro-skills. Secondly, this approach was perceived by some participants as if “going behind my back”, and as such was potentially damaging to the therapeutic relationship (essentially non-MI adherent). While well intentioned, this method was quickly dropped and it became apparent that a more comprehensive approach was required. Further work focused on producing two resources, firstly a guide-book, *Buddy basics: Information for motivational-buddies* and an instructional video, *Buddy-basics: an instructional video for motivational-buddies* (**Appendix C**).

The information booklet includes an introduction and background section and describes the rationale for the study. The content also includes an introduction to the concepts of peer-influence, social networks and their

possible effects on health outcomes and an outline of desirable buddy-skills/style along with specific practical examples. The content of the *Buddy basics* guidebook draws on a range of theoretical perspectives and empirical work including that of Bandura (1977) social learning theory; Christakis and Fowler (2007) network effects and health outcomes; Magill et al. (2010) motivational interviewing with significant other participation; Moyers et al. (2007; 2010) participant language; and Miller and Rollnick (2002) and Rollnick et al. (2008a) for a general overview of MI and its application in health-care settings. After reviewing the above literature and other published work, **Table 12** was compiled to draw together and list the support-person/buddy characteristics and behaviours thought to be desirable. This list of characteristics was used to guide the development of the booklet and represents the main topic areas covered (either implicitly or explicitly by the booklet and/or the instructional video). The booklet was trialled with buddies and feedback was sought on the content. The booklet was also peer-reviewed by the study supervisors and other interested persons, and revisions were made to incorporate all the inputs and to simplify and condense the text.

The second resource, the instructional video, was developed in two parts. Part one involved developing a voice-over script and a set of slides and graphics to depict a motivationally adherent communication style, the fundamentals of behaviour change, and the buddy role. Specifics include a description of a non-judgmental guiding style, the idea of change vs. status

quo, the relevance of personalised goals and values, useful ways to give advice and information (using conditional language) and the importance of avoiding any type of confrontation, directing, arguing or contempt, and the importance of being supportive and affirming and reinforcing of change. The second part of the video involved producing a demonstration role-play of a buddy-MI session. This involved developing a vignette, recruiting actors, recording the session in the studio, audio-visual editing, cover art and post-production.

Table 12: Desirable motivational-buddy characteristics and skills, their theoretical basis and examples of relevant literature

Characteristic	Theory/basis	Examples of supporting literature
Mutual friend/esteemed friend/spouse	Social influence and exercise Social networks and collateral health effects	(Carron, et al., 1996; Christakis, 2004; Christakis & Allison, 2006; Christakis & Fowler, 2007; Christakis & Fowler, 2008)
Selected (vs. assigned)	Buddy-system	(Cholewa & Irwin, 2008a)
Availability		
Invested in the partnership	The necessary and sufficient conditions of therapeutic personality change	(Rogers, 1957)
An appropriate role model	Social cognitive theory	(Bandura, 1977)
High in support, collaboration	The Impact of Significant Others in Motivational Enhancement Therapy	(Apodaca, et al., 2007a; Manuel, et al., 2011)
Low in Contemptuousness	Motivational Interviewing with Significant Others (MISO) Coding Manual	
Non-confrontational	The Impact of Significant Others in Motivational Enhancement Therapy	(Apodaca, et al., 2007a; Manuel, et al., 2011)
Good active/reflective listening skills	Motivational Interviewing with Significant Others Coding Manual	(Miller & Rollnick, 2002)
Endeavours to elicit change talk	Motivational Interviewing	(Miller & Rollnick, 2002)
Able to resist the righting reflex	Motivational interviewing in health care	(Rollnick, et al., 2008a)
Uses conditional or hypothetical language	Motivational Interviewing	(Miller & Rollnick, 2002)
Actively communicates an investment in the relationship	The necessary and sufficient conditions of therapeutic personality change	(Rogers, 1957)
Communicates unconditional positive regard	The necessary and sufficient conditions of therapeutic personality change	(Rogers, 1957)
Explicitly honours client autonomy	Motivational Interviewing	(Miller & Rollnick, 2002)
Expresses compassion	Motivational Interviewing	(Miller & Rollnick, 2002)
Affirming/provides feedback	Motivational Interviewing	(Miller & Rollnick, 2002)
Engages in brainstorming, planning	Motivational Interviewing	(Miller & Rollnick, 2002; Rollnick, et al., 2008a)
Actively supports goal setting	Goal theory/motivation	(Locke & Latham, 1990b)
Accountability strategies	Accountability and Responsibility in Patient Care	(Sharpe, 2000)

The role-play models some of the different types of positive interactions and buddy-language that might occur during a typical buddy-MI session

and on-screen captions are provided to highlight desirable buddy utterances as they occur. The script of the *Buddy basics instructional video* was developed with reference to the work of Hettema's (2011) *MI training videos*, Manuel, Houck, and Moyer's (2011) findings in relation to significant other participation in Project MATCH (Project Match Research Group, 1993), and Apodaca and Longabaugh's (2009) review and preliminary evaluation of the mechanisms of change in motivational interviewing. Attempting to quantitatively evaluate the effectiveness of this buddy-training approach was beyond the scope of the research project however feedback from buddies indicated that the materials were helpful.

5.8.5 *Developing therapeutic strategies*

Task (5) involved identifying a number of the *standard* therapeutic strategies from the MI method that might be particularly suited to the buddy-MI adaptation. In other words, identifying MI therapeutic strategies that lend themselves to the buddy-context and importantly, that engage the buddy in discussions with the explicit intent of eliciting participant change talk (and to some degree promoting motivationally-consistent out-of-session interactions).

MI involves a range of *standard* strategies that can be used to elicit change talk: including importance and confidence scaling, pros-and-cons, envisioning and planning for change (Miller & Rollnick, 2002). Buddy specific adaptations of these standard MI strategies were pilot tested for

feasibility and participant/buddy acceptance and response. These adaptations generally take the form of asking the buddy to provide their outside perspective of the participant's behaviour/characteristics or to relay their observations of the participant's past challenges, efforts or achievements (often buddies provided these un-prompted). For example, the adaptation of confidence scaling involves asking the buddy to rate their perception of the participant's *ability* to take steps towards change (on a scale of 1 to 10). This strategy commonly resulted in the buddy scoring the participant more highly on the confidence scale than the participant's self-rating and then going on to explain why: by reflecting, reinforcing, and affirming the participant's personal strengths, past achievements and any steps already taken towards change. Review of pilot session recordings showed that these buddy-reinforcements and buddy-affirmations commonly elicited participant change-talk and commitment talk. Eliciting participant change-talk and commitment-talk is generally the objective of using this strategy in MI, and in the buddy-MI adaptation, an *additional* opportunity is created to elicit and reinforce desire, ability, reason and need statements and to introduce and reinforce positive participant attributes.

Agreement between the participant and buddy to work on a change-plan or to develop an exercise schedule was another common outcome and this commitment to planning is often initiated collaboratively by the participant or buddy rather than by the therapist. Brainstorming and elaborating on the types of out-of-session interactions and the style of communication and

accountability that might suit the participant and strengthen the buddy relationship was another common discussion theme. The therapist was often presented with additional opportunities to reflect, affirm and selectively reinforce these buddy/participant utterances.

Finally, another common theme recorded in the pilot interviews (and subsequently in the main study interviews) was *accountability*. Accountability is a component of social engagement that has been used to describe any implied or explicit understanding between two people, or any rules and expectations that orient the agent's behaviour (the participant) to the role enacted by the overseer (the buddy) (Sharpe, 2000). According to this understanding of accountability, if a participant and a buddy establish a relationship based on trust and expected conduct, then a link will be formed between accountability and individual conscience (Sharpe, 2000). Participant initiated discussions around accountability were common in the buddy-Motivational interviews and accountability appeared to exert a motivational influence. However, the operationalisation and measurement of accountability and evaluating its possible incremental benefits within buddy-MI were all beyond the scope of this current research.

By reviewing session recordings, the therapeutic strategies most commonly identified were collated and **Table 13** lists these strategies ranked approximately by usage. These strategies all directly involve the buddy and can create opportunities for buddies to provide a perspective, pose a

question, and/or to reflect participant statements and generally encourage and support change.

Table 13: The most commonly used therapeutic strategies ranked approximately by usage

Strategy
Confidence and Importance scaling (in particular confidence)
Looking Forward/Looking Back (a buddy perspective)
Brainstorming
Change planning (short term goals/next steps)
Accountability strategies, for example establishing the style, degree, frequency and type of contact (additional, probably not normally an MI strategy)
Other less used strategies
Pros and Cons
Exploring Goals and Values
Providing information (and advice if requested)
Goal setting (medium-long)

5.9 Randomised trial

5.9.1 Intervention delivery specifics

Participants (clients) in both groups were offered between two and four sessions of face-to-face Motivational Interviewing and in the experimental buddy-MI group, sessions were conducted with the participant's self-selected motivational-buddy participating; as well as scheduled and random email prompts and follow-up for a period of 12-months (described below). For the experimental group, the study protocol did not specify parameters within which the buddy pair was expected to fit: participants were invited to self-recruit their *best choice* or *best fit* buddy. The frequency, timing and duration of the treatment were largely determined by the participants. Ordinarily, within a 50-minute hour format, the intervention typically filled

a minimum of two sessions (<1-2hrs) and a maximum of four sessions (2–4 hrs). For all participants, two initial sessions of MI were booked approximately a fortnight apart, but beyond this, the participants were invited to schedule further sessions to suit their individual needs. Miller and Rollnick (2009) suggest that if individuals are not moving in the direction of change, it makes no sense to deliver multiple sessions of MI, as if by persistence to ‘wear them down’ and 2-4 hours of MI appears to be about as much as people will tolerate.

MI session follow-up emails were sent one or two days after each and every session. These follow-up emails took the form of a personalised note thanking the participant/buddy for their participation and confirming the next appointment time. Each follow-up note also included one complex reflection and an affirmation relating to a key point from the previous MI session (as recorded in the participant's notes immediately after the session). As well as this initial feedback relating specifically to the treatment session(s), motivational-style email follow-up continued throughout the 12-month study period. In a scheduled way, this follow-up was linked to the data collection time points but random prompts and 'review-prompts' were also sent regularly. Participants were invited to report on their progress towards their goals at any time, and individualised advice and guidance on exercise and training was provided when requested. Monthly reviews of the data-base were undertaken and pro-active contacts

were initiated to ensure no participants 'slipped through the gaps'. Email communication was a key component of the intervention for both groups.

5.9.2 Setting

All MI sessions were delivered in the University of Canterbury Health Sciences Centre clinic facility. The clinic is equipped with state-of-the-art audio visual recording and one-way observational facilities and the clinic is especially suited for counselling and the assessment of behaviour-change intervention programmes. All clinic sessions were video recorded and stored for later analysis.

5.9.3 Optional activities and components

All participants (experimental and control groups) were offered the opportunity to receive guidance and/or feedback on any issues or queries around physical activity, at any time during the 12-months intervention period. Emailed queries about goal setting, activity levels and different types and intensity of activity or any other relevant topics could be answered by return email or discussed in subsequent MI sessions. Participants were guided and encouraged to be generally self-directed in their choice of exercise (e.g. walking, running, cycling, and swimming or going to the gym) and in seeking any specific instruction and/or coaching as required. Complex exercise prescription and training programmes were generally not needed or provided but basic planning, problem solving and goal setting did fit within the MI intervention.

5.9.4 *The active control intervention*

Because MI has been shown to be effective across a range of health promoting behaviours, comparing the experimental buddy-MI to no-treatment would not have been overly meaningful, notwithstanding the fact that most people who are sedentary are in all likelihood receiving *no* treatment. Therefore, the control group received an active MI intervention. The control group MI intervention differed from the experimental intervention *only* in that it involved no motivational-buddy. The active control MI intervention involved the same conscious, disciplined and flexible use of specific communication principles and strategies designed to evoke participants' own motivations for change. Emphasis was given to the underlying spirit of MI (partnership, honouring participant autonomy, compassion, evocation) in the same way as it was in the experimental intervention and the same micro-skills and strategies (including agenda-matching, pros and cons, importance and confidence scaling questions, envisioning, rolling with resistance, brainstorming and planning) were utilised: however without the input from a motivational-buddy.

With regard to *out-of-session* interactions, it was entirely possible that the formation of *spontaneous buddies* might have occurred: that is, buddy pairings that occur naturally outside of any counselling session or intervention. While the possible formation of spontaneous buddies threatened to dilute the experimental intervention effect, spontaneous buddies would not have been exposed to the MI skills training materials or

the direction and modelling available within the buddy-MI clinic sessions. Within the control MI sessions, such topics as the benefits of social support, exercise buddies, and regular group activities were neither discouraged or encouraged or differentially reinforced. MI session follow-up emails were sent one or two days after each and every session in exactly the same way as for experimental group participants. All other email follow-up was also implemented in exactly the same way as in the experimental group. The frequency, timing and duration of the treatment (the dose) were similarly determined by the participants.

5.9.5 Therapist skill development/Clinical supervision

Building on the pilot study, two related processes, clinical supervision/coaching and fidelity monitoring, were continued to ensure that quality MI was delivered equivalently to participants in both groups. While related, these two processes were conducted separately as described below. The therapist/PhD candidate level researcher holds a Bachelor of Sports Coaching (BSpC) and a Master's degree in Health Sciences (MHealSc) including sports psychology and MI papers, and a three-day training workshop specific to the MITI 3.1.1 instrument (Moyers, et al., 2010). From this baseline, the therapist/researcher received supervision/coaching and feedback spanning the intervention period of the main study.

Using the methods developed during the pilot period, each video recording was first reviewed by the researcher and scored using the MITI 3.1.1

instrument (Moyers, et al., 2010). The MITI scores were entered into an EXCEL[®] spreadsheet and graphs were generated to map the following dimensions: Global MI Spirit; the Reflection: Question ratio (R: Q); the percentage of Open Questions (out of all questions) (%OC); and the percentage of Complex Reflections (out of all reflections) (%CR). In addition, the therapist/researcher carried out self-reflective analysis after selected sessions: writing a reflection (1-2 paragraphs), identifying strengths and less strong characteristics and writing a plan to improve particular aspects of practice as identified.

In addition, the therapist/researcher (DB) received fortnightly feedback and on-going coaching from a University-based PhD level MI trainer (MWB); a Member of the Motivational Interviewing Network of Trainers (MINT). Supervision/coaching included the review of recordings, coding exercises and calibration of coding, observation and coding of MI sessions in real-time and on-going reviews of performance, with a focus on continuous skill development. A therapist skill level of 'competency' was achieved consistently across all of the MITI subscales.

Note: Both the Motivational Interviewing Skill Code (MISC) (Miller, Moyers, Ernst, & Amrhein, 2008) and the Motivational Interviewing with Significant Others (MISO) (Apodaca, et al., 2007a) could have been applied to analyse *buddy* utterances and provide additional data but this was beyond the scope of the current study.

5.9.6 *Fidelity monitoring*

On-going fidelity monitoring³⁶ was via the MITI 3.1.1 instrument (Moyers, et al., 2010) as per the standard recommended protocol for the review of recorded MI sessions. Fidelity was calculated based on retrospective random sampling of 25% of the total number of interviews per quarter (i.e. four experimental and four control group = eight sessions @ 20min). The randomly selected video clips selected by the coder were collated by the researcher and a master DVD was produced by copying the 20-min clips inserted in random order onto one fidelity sample DVD. As a default, 20-minute video clips were cut from the session beginning from the last utterances related to the introduction and study background and/or other administrative topics. The selected video clips were then scored by the PhD level MI trainer (MWB) using the MITI 3.1.1 instrument. Fidelity data (in particular between-group comparisons) were analysed and fed back to the therapist during supervision and subsequently used in later data analyses. Example first quarter data are presented in **Table 14** and these also demonstrate the positive progression in therapist skill compared to the pilot study data presented earlier in (**Table 11**).

³⁶ The 'study wide' fidelity strategies employed in the pilot and here in the RCT were guided by The Behavioral Change Consortium developed model and are described in detail in the **Discussion**. With reference to Resnick et al., (2005) and also Bellg et al. (2004).

Table 14: Main study first quarter fidelity scores via the MITI 3.1.1 instrument and reference competency thresholds, n = 8 participants

Measure	Competency thresholds	Control group	Experimental group
Global clinician rating	≥4	4.08	4.0
Reflection to Question Ratio (R:Q)	≥2:1	3.55	3.25
Percent Open Questions (%OC)	≥70%	71.3%	73%
Percent Complex Reflections (%CR)	≥50%	68%	59.2%
Percent MI-Adherent (% MIA)	100%	100%	100%

OQ = Open Question; CR = Complex Reflection; R:Q = Total Reflection to Question ratio; %CR = the percentage of complex reflections out of the total number of reflections; %OC = the percentage of open questions out of the total number of all questions.

5.9.7 Administration and follow-up

Microsoft Outlook™ was used to schedule and prompt the researcher to deliver the protocol-specified interventions (experimental or active control) to the appropriate participants and to record participant contacts, and the completeness of data collection at the specified intervals. Each participant was individually contacted at each follow-up time-point and the appropriate URL link was included in the email so that the participant could access the web-based questionnaire and submit their physical activity logs and other data.

Email follow-up was also used to maintain or up-date the participant's contact details, to up-date the participants as to the time line of the research project (i.e. reminding participants when the next scheduled questionnaire was due) and reaffirming engagement with the study. While the purpose of these particular emails was principally administrative, they were nonetheless delivered in the style and spirit of MI and participants were free to engage in correspondence to any degree they wished.

5.10 Outcome measures/instruments

5.10.1 Rationale

The basic context of the study is physical activity promotion for the purpose of increasing individuals' fitness and health (see **Table 15**, p.210 for a summary of outcome measures used). Obtaining robust data about individuals' physical activity behaviours is not easily achieved and there is to date no one universal *gold standard* measurement method. Both indirect and direct measures of physical activity are useful but none are without certain reliability, validity, sensitivity, feasibility and/or cost issues (Blair, 1984). As illustrated in **Figure 14**, there are many possible points of testing the different dimensions of physical activity, and therefore there are many different methods of measurement. When considering the measurement of total energy expenditure, several methods are available including: direct observation, accelerometers, continuous heart rate monitoring, GPS data logs, pedometers, pen-and-paper activity logs, and the doubly labelled water method³⁷. Considering the range of options from a practicality/cost-benefit perspective, two measures were chosen for this study: a self-report physical activity recall questionnaire and cardio-respiratory fitness as

³⁷ Doubly labelled water: a non-intrusive method for measuring energy expenditure in free-living subjects. While this method is arguable the most accurate and objective method of measuring physical activity, it is expensive and it cannot distinguish different intensities or durations of physical activity, only the total energy expenditure over a given time period. The method involves subjects drinking non-radioactive isotopes of hydrogen and oxygen and then measuring the elimination rates (exhaled CO₂, and water loss in urine, sweat, and breath) of the non-radioactive markers in the subject over time through the regular sampling of saliva, urine, or blood. Finally, the total metabolic rate can then be estimated by calculation (regarding the ratio of oxygen used in metabolism) (McArdle, Katch & Katch, 2007).

measured by a sub-maximal walk/run test (both are described more fully below, see 5.11.1.1 and 5.11.1.2).

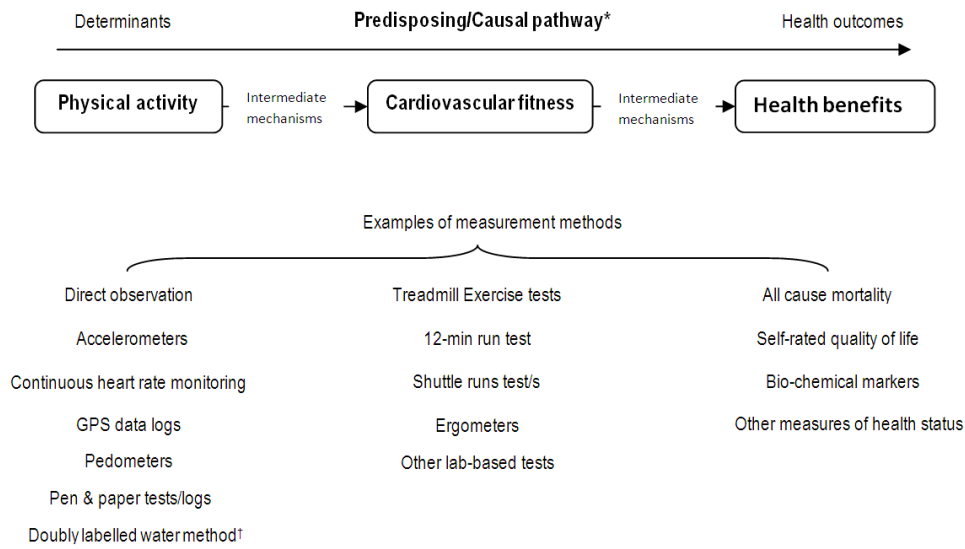


Figure 14: Examples of measurement methods and points of measurement related to physical activity, cardio-respiratory fitness and health outcomes.

*Physical inactivity is considered by many researchers to be only a *predisposing* risk factor for diseases such as cardiovascular disease: due to the unfeasibility and non-ethicity of long-term physical activity (vs. inactivity) RCT studies with mortality as an end point, and due to lack of complete understanding of its mechanisms of action.
†Doubly labelled water: a laboratory-based method that is arguable the most accurate but expensive method of measuring total energy expenditure over a given time period (Hardman & Stensel, 2009; McArdle, Katch, & Katch, 2007).

While some self-report measures have been shown to overestimate physical activity and others underestimate physical activity at different intensities, between-group comparisons in a randomised trial should generally be valid. Cardio-respiratory fitness has been shown to be a useful indirect or proxy-measure for physical activity. In previously sedentary people,

exercising at 75% of aerobic power³⁸, for 30-minutes, three times a week over six-months has been shown to increase cardio-respiratory fitness (measured as VO₂max) an average of 15-20% (Pollock, 1973). Similarly, a more recent meta-analysis found that endurance training improves cardio-respiratory fitness in older adults by 16.3%, compared with control groups (Huang, Gibson, Tran, & Osness, 2005) and this upper limit is thought to be reached within 8 to 18-months of endurance training (Wilmore & Costill, 2005). Therefore, to strengthen the concurrent validity of the findings, measurements of both physical activity levels and cardio-respiratory fitness were undertaken.

5.11 Primary outcomes

5.11.1.1 Self-reported physical activity

Physical activity comprises a complex set of behaviours that include habitual active commuting, recreational activities such as gardening, and more purposeful exercise activities such as gym-based exercise and sport. This range of activities presents many measurement challenges, and an instrument that can effectively quantify the *true* level and pattern of an individual's activity behaviour does not yet exist. However, self-report questionnaires provide a reasonably accurate and simple method of estimating total energy expenditure – the most important health-related dimension of physical activity. The International Physical Activity

³⁸ Aerobic power is the proportion of the work-rate achieved at VO₂max that may be achieved or utilised during sustained sub-maximal exercise (steady state exercise) (Wilmore et al. 1970).

Questionnaire (IPAQ) (Long form – last 7-days self-administered, for use with young and middle-aged adults 15-69 years) (Craig, et al., 2003) was used to assess participants' levels of physical activity at baseline and at one, three and 12-months. The IPAQ was used to obtain internationally comparable data on health-related physical activity (De Cocker, De Bourdeaudhuij, Brown, & Cardon, 2007). The development of the IPAQ measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. In an effort to reduce over-reporting and increase accuracy, Rzewnicki et al. (2002) recommend implementing survey procedure changes without changing the IPAQ items themselves. These changes include additional instructions to subjects regarding the intensity and duration parameters, screening for extreme reports and probing such responses (e.g. if the product of days and hours exceeds set levels or if total reported physical activity time including time reported sitting, is questionable). These measures were adopted to increase the accuracy of the physical activity data.

5.11.1.2 *Cardio-respiratory fitness*

This Cooper 12-min test provided a means of monitoring the effect of training (physical activity) on the participants' physical development³⁹. The Cooper 12-minute run test (Cooper, 1968) is a sub-maximal running/walking test designed to assess individuals' aerobic fitness. The

³⁹ In previous research, sedentary people, training at 75% of aerobic power, for 30 minutes, 3 times a week over 6 months demonstrated increases in VO₂ max, on average, of 15-20% (Pollock, 1973).

objective of the test is to measure the maximum distance covered by the individual (walking/running) during the 12-minute period and is usually carried out on a running track for ease of measuring the distance (the test can also be conducted on a treadmill or using GPS or accelerometer measurement of the distance). A stopwatch (preferably with a countdown timer) is required for ensuring that the individual runs for exactly the correct amount of time. One advantage of the Cooper 12-minute run/walk test is that the test can also be undertaken by people who cannot run, as well as people who prefer to use a treadmill (a 1° treadmill gradient is used). Note: the Cooper test was preceded by the Physical Activity Readiness Questionnaire (PARQ) (**Appendix A**) as a screening test, to identify people who should not participate in vigorous exercise or testing.

Cooper developed the 12-minute run test in 1968 for the US army and reported a very high correlation between the distance that an individual can cover in 12-minutes and the efficiency with which the body can use oxygen for running. Over time, normative tables were developed that fairly accurately indicate the level of aerobic fitness based upon the maximum distance travelled during the Cooper fitness test, and the normative data are stratified by age and gender. The reliability of this test can be influenced by several factors including practice, pacing strategies and motivation level but there should be good reliability if these factors are standardised as much as possible.

Over time, maximum oxygen uptake (VO_2max) tables (fitness tables) have been published and the correlation to actual VO_2max (measured in the laboratory) is reported to be high. Cooper (1968) reported a correlation of 0.90 between laboratory determined VO_2max and the distance covered in a 12-minute walk/run (data for men only). Subsequent studies have validated the test for women also, with correlations of between 0.54 – 0.91. In an evaluation of several indirect tests of aerobic capacity, McNaughton et al. (1998) found the 12-minute run to have the highest correlation of .88, followed by the 1.5 mile run .87, 20-m progressive shuttle run .82, and the treadmill jogging test .50.

Advantages of the Cooper 12-minute run test include the test not requiring any specialised equipment, only a running track (or treadmill) and a stopwatch, and the test can be self-administered at any time by the participant. Walking/running are the most natural forms of locomotion and require no special instruction. The test is safer than maximal tests and if the participant is symptom and disease free, no physician supervision is required. The test provides a quick cost-effective assessment of cardio-respiratory fitness. Disadvantages include less accuracy than ‘gold standard’ laboratory measures: as VO_2max is not directly measured (error rate of 10-20%) and maximal heart rate is not measured (HRmax).

5.11.1.3 *Self-reported health related quality of life*

The current concept of health-related quality of life (HRQOL) acknowledges that people rate their actual situation in relation to their individual expectation (Greenfield & Nelson, 1992). In this context, the importance of interpreting changes in health status has a central role. The SF36v2 (owned by Quality Metric, USA) is a multi-purpose, self-administered short-form health-related quality of life survey with only 36 questions (up-dated from the SF36, Ware, Snow, Kosinski, & Gandek, 1993). The SF36v2 yields an 8-scale profile of physical function; role limitations due to physical problems (role-physical); role limitations due to emotional problems (role-emotional); vitality; bodily pain; social function; mental health; and general health. It is a generic measure, as opposed to one that targets a specific age, disease, or treatment group. Accordingly, the SF36v2 has proven useful in surveys of general and specific populations, comparing the relative burden of diseases, and in differentiating the health benefits produced by a wide range of different treatments. For summary scores, factor weights derived from the U.S. general population are applied to the eight SF-36v2 scales to compare with a mean of 50 and standard deviation of 10 in the general population. Compared to the SF36, the SF36v2 domain scales define a wider range of each construct, therefore, the ceiling and floor effects found with SF-36 are less problematic and the incorporation of revised role functioning items has also improved the scale (Ware, et al., 2007). The survey was administered via an on-line

questionnaire using SurveyMonkey's[®] third party software and scored using Quality Metric's electronic scoring software version-4.5[®].

5.12 Secondary outcomes

5.12.1.1 Self-efficacy

The Generalised Self-Efficacy scale (GSE) (Schwarzer et al., 1981) was used to assess general task-related confidence. The GSE is a 10-item scale designed to assess optimistic self-beliefs used to cope with a variety of demands in life. The scale was designed to assess generalised self-efficacy or the belief that one's actions are responsible for successful outcomes. The scale was originally developed by Schwarzer and Jerusalem (1981) in Germany and has been translated into many languages. Studies have shown that the GSE has high reliability, stability, and construct validity (Cronbach alpha ranges from 0.75 to 0.94 across a number of different language versions) (Rimm and Jerusalem 1999; Luszczynska et al. 2005). Relations between the GSE and other social cognitive variables (intention, implementation of intentions, outcome expectations, and self-regulation) are high and confirm the validity of the scale. Perceived self-efficacy facilitates goal-setting, effort investment, persistence in face of barriers and recovery from setbacks (Luszczynska et al. 2005). Each scale item refers to successful coping and implies an internal-stable attribution of success. Perceived self-efficacy is an operative construct, that is, it is related to subsequent behaviour and therefore is relevant for behaviour change

research. The scale is designed for the general adult population, including adolescents. The scale is self-administered, as part of a more comprehensive questionnaire, and it requires approximately four minutes on average to complete. As a global measure, the GSE does not tap any specific behaviour change, therefore, in this application it was necessary to add items to cover the particular context (physical activity) (Schwarzer & Fuchs, 1996). For this reason, the GSE was modified to include five additional *exercise self-efficacy* questions, specifically the Exercise Self-efficacy Scale (ESE) (Schwarzer & Renner, 2000).

5.12.2 Exercise stage of change (readiness)

Participant's readiness for change was measured using the Transtheoretical Model (TTM) (Prochaska & DiClemente, 1982). The central organizing construct of the TTM is the stages of change. The model emphasises the importance of the stage schema because it represents a temporal dimension and the idea of readiness. Change implies phenomena occurring over time and this aspect has often been largely ignored by alternative theories of change. Behaviour change is often construed as an event, such as quitting smoking, drinking, or over-eating. Prochaska and DiClemente's (1982; 1984) TTM interprets change as a process involving progression through a series of five stages: pre-contemplation, contemplation, preparation, action, and maintenance. Two instruments have been designed specifically for exercise behaviours, namely the Exercise Stages of Change: Short Form (Marcus, Selby, Niaura, & Rossi, 1992) and the Exercise Stages of Change:

Continuous Measure (24 item questionnaire) (Marcus, et al., 1992). The short form was selected here for its brevity as it asks subjects to select one of five categories that best describes their engagement in planned physical activity with respect to the following definition of regular exercise:

“Regular Exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc) performed to increase physical fitness. Such activity should be performed 3 to 5 times per week for 20-60 minutes per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat” (Marcus et al., 1992 p.56).

Question: Do you exercise regularly according to that definition?

- ☐ Yes, I have been for MORE than 6 months (= Maintenance)
- ☐ Yes, I have been for LESS than 6 months (= Action)
- ☐ No, but I intend to in the next 30 days (= Preparation)
- ☐ No, but I intend to in the next 6 months (= Contemplation)
- ☐ No, and I do NOT intend to in the next 6 months (= Pre-contemplation)

5.12.2.1 Social support

The Norbeck Social Support Questionnaire (NSSQ) (Norbeck, 1995; Norbeck, Lindsey, & Carrieri, 1983) was used to measure multiple components of social support including functional properties of social support (e.g., emotional and tangible support) and network properties (e.g., network size, stability of relationships, frequency of contact), as well as eliciting descriptive data about recent losses of supportive relationships. Respondents were asked to list first names or initials for each significant person in their lives who provides personal support to them. Then they

indicated the kind of relationship (e.g., spouse or partner, family members or relatives, friends, work or school associates, neighbours, health care providers, counsellor or therapist, other) for each person on this network list. Finally respondents used a 5-point rating scale to describe the amount of support that had been available over the past 6-months from each person on their network list (Norbeck, 1995; Norbeck, et al., 1983).

5.12.3 Participant's experience with the programme and motivational-buddy attributes: qualitative and quantitative findings

Seven additional exit-questions were added to the final version of the on-line follow-up questionnaire (four only for control participants) (**Appendix A**). These questions were derived from several sources (discussed below) and were designed to elicit quantitative and qualitative responses relating to participants experience with the programme (both groups), the nature of the support provided by motivational-buddies, and the buddies' motivational style, attributes and actions. The questions included both multi-choice and free-response items and the opportunity for participants to include 'other' comments as desired.

The questions and their response items were constructed from four main resources: the Partner Interaction Questionnaire PIQ-20 (Cohen & Lichtenstein, 1990), the Motivational Interviewing with Significant Others

(MISO) coding manual (Apodaca, et al., 2007a), the Motivational Interviewing Treatment Integrity instrument (MITI) (Moyers, et al., 2010) and from participant feedback and MI session notes. The 28 multi-choice items provided for question six are descriptors drawn from the PIQ-20, MISO and MITI global scales (including both descriptors for attributes considered 'positive' and also attributes considered 'negative' or unhelpful for behaviour change). The 17 multi-choice items relating to question five were collated from study participant feedback and interview notes.

In summary, the exit surveys asked about changes participants made in the preceding 12-months (including levels of leisure-time and/or transport-related physical activity), and about the time invested by motivational-buddies, the types of actions and support provided by buddies and the attributes that buddies demonstrated within their motivational-buddy role.

5.12.4 Buddy empathy

Buddy empathy was measured (at baseline) using the Helpful Responses Questionnaire (HRQ) (Miller, Hedrick, & Orlofsky, 1991). This instrument is a brief six-item free-response questionnaire designed specifically as a measure of accurate empathy. The HRQ was offered to each motivational-buddy at the first Motivational Interview session and was completed either in pen-and-paper form or later on-line. The six questions and the scoring guide are listed in **Appendix A**.

While direct observation is a frequently used approach for recognising and measuring empathy as it occurs, the HRQ open-response questionnaire was selected as a measure of the motivational-buddy's ability to generate empathic responses (in general). Therefore, accepting that empathic responses are more likely to be helpful than directive or confrontational responses, the HRQ was included to provide some measure of the *quality* of support provided by the motivational buddy (or their 'helping style'). The HRQ items simulate statements from hypothetical individuals with specific concerns/issues and participants write a sentence or two to outline the next thing they would say to that person to be helpful in each of the six specific situations. The HRQ is scored by rating each response on a 5-point ordinal scale of depth of reflection. Scale definitions integrate Truax's (1967) depth of reflection rating system with concepts from Gordon (1970) (summarised in **Appendix A**). Examples of unhelpful responses (or 'roadblocks' to effective communication as described by Gordon) include responses that communicate un-acceptance (ordering, commanding, directing, warning, cautioning, moralising, and advising), responses that tend to communicate inadequacies (judging, criticising, analysing, diagnosing) as well as denying, problem solving and avoidance.

Prior to coding, all responses were down-loaded, numbered, and randomly sorted into a table so that raters could not identify which responses had been written by the same respondent. This blind rating system was employed to remove possible biases due to knowledge of group status or to

halo effects caused by scoring multiple responses known to be made by the same individual. After scoring, the responses were re-mapped to each participant and the item scores summed to provide the final scores. The interrater reliability for total HRQ scores (sum of the six item scores for each respondent) has been found to be .932 ($p < .001$) (Miller et al. 1991).

5.12.4.1 *Demographics*

- Age
- Sex
- Smoking: Current smoking status via self-report: yes/no response
- Ethnicity: Ethnicity was assessed using the 1992 Census question, as specified by the Ethics Committee, for use in health research.
- Height: via self-report
- Weight: via self-report

Table 15: Outcome measure summary table

Outcome measure	Instrument	Explanation	Administered
Primary			
Self-reported physical activity	International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003)	Long form – last 7-days recall, self-administered on-line questionnaire	Baseline, 1, 3 & 12-months
Cardiorespiratory fitness	Cooper 12-minute run test (Cooper, 1968)	Sub-maximal running/walking test to assess aerobic fitness: converted to VO2Max as per Cooper (1968)	Baseline, 1, 3 & 12-months
Health-related quality of life	SF36v2 (Quality Metric, USA)	Self-administered short-form health-related quality of life survey	Baseline, 1, 3 & 12-months
Secondary			
Exercise readiness (stage of change)	Exercise Stages of Change - Short Form (Marcus, et al., 1992)	One item short form exercise readiness questionnaire based on the Transtheoretical Model (Prochaska & DiClemente, 1983)	Baseline, 1, 3 & 12-months

Table 15: Outcome measure summary table (continued)

Self-efficacy	Generalised Self-Efficacy scale (GSE) (Schwarzer et al., 1981) with additional Exercise Self-efficacy Scale (ESE) items added (Schwarzer & Renner, 2000)		Self-reported self-efficacy and exercise specific self-efficacy	perceived and self-efficacy	Baseline, 1, 3 & 12-months
Social support	Norbeck Social Support Questionnaire (NSSQ) (Norbeck, Lindsey, & Carrieri, 1981; Norbeck, et al., 1983)		Measures components of social support including functional properties, network properties, amount of support from specific sources as well descriptive data about recent losses	multiple of social support including properties, network properties, amount of support from specific sources as well descriptive data about recent losses	Baseline & 12-months
Motivational-buddy empathy/helping style (Experimental group only)	The Helpful Responses Questionnaire (HRQ) (Miller, et al., 1991)		A measure of helping-style/ empathy, a brief free-response questionnaire		Baseline
MI outcomes					
Treatment fidelity	Motivational Treatment instrument (MITI) (Moyers, et al., 2010)	Interviewing Integrity (MITI 3.1.1)	Used to code and rate randomly selected interview recordings		25 % random selection of all MI session recordings
Qualitative					
Participant/Buddy exit surveys	A brief seven question multi-choice and free-response questionnaire		Analysed using thematic analysis and by collating multi-choice responses		12-months

5.12.5 Ethics

Approval for this study was granted by the University of Canterbury Ethics Committee and by the CPIT Research and Knowledge Transfer Committee, Ethics Subcommittee, in accordance with usual procedures. In addition, each participant was required to sign an informed consent form after being given the opportunity to read the introductory letter and the subject information-sheet and after having the study explained by the principal researcher and having had any questions answered to the subject's satisfaction. Although not formally enrolled in the study, these basic tenants also applied to the experimental group motivational-buddies. The motivational-buddies were also required to sign a simplified informed

consent form after being given the opportunity to read the introductory letter and the *buddy information sheet*.

5.12.5.1 *Main ethical points of consideration*

5.12.5.2 *Overview*

The main ethical points for consideration included that all participants understood, and accepted that if they took part in the research study they were not guaranteed to gain any direct personal benefit from it (although it was considered highly unlikely that any participant would gain nothing). Participants needed to understand and confirm that they would be taking part in the research of their own free will and that they could withdraw from it at any time and for any reason, without any medical care or legal rights being affected. Participants also needed to understand and accept that their participation in the study could prompt them to reflect on and evaluate their current health status and lifestyle choices. In the case that any participant presented with obvious psychological disturbance, he or she was to be referred on for appropriate help or information, and the study supervisors were to be notified. Participants were assured that all information collected in the research study would be held in confidence (stored in password protected computer files and locked filing cabinets) and that if findings were to be presented or published, all participants' personal details would be removed.

5.12.5.3 *Physical well-being*

Fitness and exercise researchers have a *duty of care* and are therefore under obligation to prevent participants from coming to harm. The use of pre-exercise screening questionnaires helps to minimise the risk of participants coming to harm whilst exercising and/or undergoing fitness testing. The Physical Activity Readiness Questionnaire (PARQ) (**Appendix A**) is a group of seven questions, a flow chart, and notes, which have been designed in order to identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable.

The PARQ was originally developed from the American College of Sports Medicine guidelines (1988) and revised in 1992 by Thomas et al. (1992) and again by the Expert Advisory Committee of the Canadian Society for Exercise Physiology (2002). The original aim of the PARQ was to identify those who might be at risk of injury or harm if they undertook a physical fitness test (in this case, the Cooper 12min walk/run test). Currently, the PAR-Q is recommended as the minimum medical screening tool, by the American College of Sports Medicine (ACSM) for people starting low–moderate intensity exercise. The PARQ was considered wholly appropriate for use as a screening tool in this study. It was acknowledged that participants would likely perceive physical stress during the fitness test; however, as the test is sub-maximal, self-administered and self-paced, such stress was ultimately within the individual participant's control. The risk of

adverse or excessive physical stress should not have exceeded that normally associated with participating in vigorous physical exercise. In addition to the seven specific screening questions, the PAR-Q also includes the special note that if a participant's health status changes (adversely), then a consultation with a health professional (e.g. GP) is recommended.

5.12.5.4 *Actions and support mechanisms*

In cases where the participant was conducting the test using a running treadmill at a gym, club or fitness centre, then the safety procedures implemented by that institution applied. In the cases where participants would be conducting the test *in the field* or on a running treadmill in their own home, it was deemed that a reasonable level of protection could be achieved (if desired) by engaging an observer for the duration of the test, and/or normal emergency services in the case of an adverse event. These recommendations were made to each participant verbally and in writing (being added to the instructions for the Cooper 12min fitness test); however it was not possible for the principal researcher to supervise the fitness tests or enforce such precautions, as the tests were self-administered across a variety of settings.

5.12.5.5 *Mental/emotional distress*

It was anticipated that some participants would experience psychological stress/anxiety resulting from the survey process or the motivational interview process. This may have arisen from highlighting *actual versus ideal* discrepancies and/or ambivalence (i.e. an individual's current

behaviour and health status being highlighted as being other than the individual's *ideal*).

5.12.5.6 *Actions and support mechanisms*

Motivational Interviewing is a directive psychosocial intervention used to identify and resolve discrepancies between desired behaviours and actual behaviours, and to increase motivation for behaviour change. Therefore, MI is an interaction by which psychological stress/anxiety may be both created and resolved. Any emergency concerns/issues (occurring on-site) were to be notified to the University Security services immediately (however, no emergency situations arose). Non-emergency concerns/issues were to be notified to the study supervisor as soon as possible (no instances). All participants were provided with the senior supervisor's contact details such that they could query any procedure or outcome, or report any concerns in confidence. If a participant presented with obvious mental/emotional distress (e.g. anxiety and/or depression), the principal researcher was to proactively encourage the participant to seek advice and/or support from the supervisory team, the student health centre, or the participant's GP as appropriate (however, no such situations arose).

5.12.5.7 *Moral and/or cultural offence*

The likelihood of giving moral or cultural offence was considered very low. Motivational Interviewing (MI) involves a collaborative, supportive and non-confrontational approach. MI is specifically supportive of the participant's autonomy and the practitioner makes a genuine effort to

understand the participant's perspective (acknowledging and accepting the participant's value system) and an equally genuine effort to convey that understanding to the participant (an inherent element of reflective listening).

5.12.5.8 Actions and support mechanisms

The planned actions and support mechanisms were essentially the same as for (b) above: Mental/emotional distress (with the additional option of consulting a UC cultural advisor if necessary).

5.12.5.9 Cultural appropriateness/competency

MI explicitly honours autonomy, people's right and absolute ability to decide about their own behaviour. The focus of the motivational interviewing sessions was essentially on how behavioural changes might be congruent with the individual's visions for the future and personal and cultural values. The intervention and context was intended to be transcultural, that is, to be culturally appropriate and align well with Māori (the indigenous people of New Zealand) and other cultural groups' values. Māori hold a keen respect for place (their home region's mountains, rivers and lakes) as well as placing great importance on the concept and involvement of whanau or family. This is in contrast to the typically individual-centred world-view of many colonists/ European settlers/non-Māori. Durie's (1994) Whare-Tapa-Wha model (**Figure 15**) depicts the four sides of a house with each complementing the other in supporting wellness. Every effort was made to ensure that the intervention was

compatible with these four dimensions. The Whare-Tapa-Wha model is but one model to which participants might align but the MI intervention was intended to be inclusive and amenable to different cultural values.

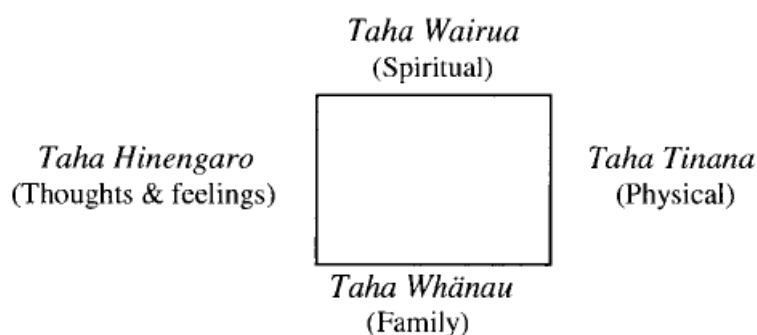


Figure 15: The Whare-Tapa-Wha model

Source: Durie, (1994).

In the wider context, the 1840 Treaty of Waitangi is regarded as the founding document of New Zealand. The so-called ‘principles’ of the Treaty - partnership, participation and protection, guide public policy in relation to Māori. The government’s most recent Māori policy document, He Korowai Oranga: the Māori Health Strategy (Ministry of Health, 2002), acknowledges the principles of the Treaty of Waitangi, reinforcing earlier policy directions. Whanau ora, meaning “Māori families supported to achieve their maximum health and well-being” is the primary objective of the policy. The MI interventions were intended to recognise and align with the principles of the Treaty - partnership, participation and protection and the Whanau ora model.

5.13 Analysis

5.13.1 Introduction

The analysis⁴⁰ did not attempt to, nor was capable of, testing any particular health behaviour theory (HBT) per se. Motivational Interviewing (MI) is not a theory but an evidence-based treatment method. This study used a parallel group randomised trial which involved applying two treatments (in this case a novel experimental treatment and a proven active control treatment) to the subjects of the experiment to see if the response variables' values changed (in this case health outcomes). Therefore, the study was fundamentally a 'head-to-head' therapeutic intervention trial. At this level (hypothesis testing) statistical analyses were employed to establish whether or not the two interventions differed in their effects. The study data were analysed by the statistical methods of linear regression and more specifically here, mixed-effects linear regression modelling (detailed below and further in the results chapter). This allows for the estimation of the range of response variable values that the treatment(s) could potentially generate in the population as a whole.

Secondary to the evaluation of treatment effectiveness, the enquiry extended (in a limited way) to factors relating to possible mechanisms of action thought to be involved in MI mediated behaviour change. This study tested the feasibility and relative merit of formally enlisting a social support

⁴⁰All statistical analyses were overseen by the UC postgraduate consultant statistician, to ensure that appropriate and robust procedures were followed. The R program was used for the analysis.

person or motivational-buddy as a component of the motivational interviewing process, and some additional information relating to this process is provided by the qualitative data.

5.13.2 Collating and processing the data

The IPAQ self-report physical activity logs were scored and the data processed and cleaned in accordance with the IPAQ scoring manual (similarly for the SF36-v2 and the other questionnaires). The average intervention dose per group was calculated from the recorded number of sessions. The MITI 3.1.1 data were analysed for any significant differences in treatment fidelity or quality so that statistical adjustments could be made for between-group differences as necessary. The intention to treat principle was adhered to, that is, all randomised participants were analysed in the groups to which they were originally assigned, regardless of their adherence with the entry criteria and the treatment they actually received and regardless of subsequent dropout or any other deviation from the protocol (Moher, Schulz, & Altman, 2001).

5.13.3 Statistical methods

The study produced repeated measures data consisting of multiple *profiles* of participants' health outcomes across four fixed time-points. Linear regression is an approach used to model the relationship between a dependent variable 'y' (here, a health outcome) and one or more explanatory (or predictor) variables denoted 'x'. Multiple linear regression

generalises the methodology of simple straight-line regression to allow for multiple explanatory or predictor variables (Maindonald & Braun, 2007).

There are two common assumptions made about an individual specific effect, the random effects assumption and the fixed effects assumption. Linear regression models that treat the explanatory variables *as if* the quantities are non-random are termed *fixed-effects* models. This is in contrast to random-effects models and mixed-models in which either all or some of the explanatory variables are treated as if they arise from random causes.

The terms *fixed* and *random* are not used here to describe innate properties of variables, but rather, assumptions made about them, and in this case the use of fixed and random *assumptions* is a statistically efficient way to deal with repeated measures data. Fixed effects are those which are true for the entire population. The assumption is that, other things being equal, the difference between men and women or group-one and group-two or baseline and time-four will always be the same. Random effects by contrast are person-specific. Therefore, the assumption here is that each *person* has an innate person-specific level of fitness, for example, but all the fixed effects variables (sex, age, time, etc.) affect everybody in the same way. Therefore, only the unique participant identifier is included as a random variable (in the detailed example beginning on p.240, the "(1|ID)" term is the random variable term used to inform the model of the repeated

measures structure of the data: one measurement taken for each individual across four time-points).

Using a mixed-effects model increases the efficiency of the analysis and the approach is often appropriate for representing clustered, and therefore dependent data – arising, for example, when data are gathered over time on the same individuals (Raudenbush & Bryk, 2002). A mixed-effects model contains experimental factors of both fixed and random-effects types, where multiple correlated measurements are made on each unit of interest, and applies appropriately different interpretations and analysis for the two types (Bates, 2005). In this analysis, the focus was on both accurate prediction of the 'y' estimates (so called 'adjustments' to the data) as well as a focus on the regression coefficients themselves to quantify the strength of any relationship between y and specified x-variable(s). It is important to be mindful from the onset that regression is a study of association, not causality.

Mixed models were used to assess all outcomes for the impact of group (intervention and control), time (treated as categorical with levels at baseline, one and three and 12-months) and the group-by-time interaction, with these terms forming the base model. Differences of means and 95% confidence intervals were determined using the linear mixed models. The baseline scores for subjects who dropped out were retained, consistent with an intention-to-treat analysis. Mixed models are more robust to the biases

of missing data, and provide better control of type-I and type-II errors than does last observation carried forward analysis of variance (Raudenbush & Bryk, 2002).

With regard to model 'fit', the variables which *must* be adjusted for (such as the demographics age and gender) were included along with the other variables that were being tested for their *effect*. While the essential demographics and other known confounders must be retained regardless, other non-significant predictor variables may subsequently be dropped for a more parsimonious model (when the estimation of y is the main focus). However, as the purpose in this case was to determine the estimates *and* to test for the effects of the predictor variables of interest, these variables needed to be retained (to be 'testable' they need to be retained in the model).

There is some discussion as to whether '% explained variation' (the notion of explained randomness) is useful for mixed effects models (Xu, 2003), however R-squared (R^2) was calculated by fitting the model without any covariates (fixed effects only). The R^2 statistic measures multivariate association between the repeated outcomes and the fixed effects in the linear mixed model. The R^2 for linear mixed effects models are very similar to the well-known R^2 for linear regression, except that they count for the additional random covariate effects and the additional clustering effects (Xu, 2003). Although R^2 can be used as one tool to refine the fit of a model, here, the concern was not with fit but with predictability. In

planning new programme evaluations however, R^2 might be used to guide model fit such that resources are not wasted gathering data on variables already shown to be unrelated to the outcomes of interest (Xu, 2003). R^2 answers the question "what amount of the variation seen in the outcome variable is explained by the covariates"? (see the worked example in **Results**).

5.13.3.1 *Significance testing*

Investigators have used both one- and two-tailed tests to determine the significance of findings yielded by program evaluations. Here, two-tail tests were applied in all instances. Arguably, one-tail tests may be used when either the direction of expected findings has been stipulated in advance or because prior evaluations of similar programs have yielded no negative results (Ringwalt, Paschall, Gorman, Derzon, & Kinlaw, 2010). Neither of these criteria applied because it was *not* known if the experimental adjunct could be delivered successfully, nor were there any other published trials of the same intervention, population and indication that could serve as an assurance that there was 'no reason whatsoever' to suspect non-hypothesised results. Therefore two-tailed tests were used to evaluate any differences objectively and subjective interpretation of the results was applied to determine the direction of the differences noted (Lombardi & Hurlbert, 2009).

5.13.4 Effect size

In addition to the resultant estimates and confidence intervals and p -values, it is also necessary to report on the 'bigger picture' which includes both the p -value (statistical significance) and the effect size (the practical significance). Considering both statistical and practical significance together further adds to the information available with which to determine whether the outcome may or may not have occurred by chance. Reporting the size of the effect(s) also allows for comparison of the outcomes with other published studies and meta-analyses. Effect sizes (ES) can be viewed as the average percentile standing of the average treated (or experimental) participant relative to the average untreated (or control) participant or similarly (within-group) for the same participants at baseline relative to follow-up (Rosnow & Rosenthal, 1996). There is a wide array of formulas used to calculate ES (Dunlop, Cortina, Vaslow, & Burke, 1996) and the broad method used here is the standardized difference between two means, specifically Cohen's d (Cohen, 1988). By convention the difference between the two means is presented such that the effect is positive if it is in the direction of improvement or in the predicted direction and negative if in the direction of deterioration or opposite to the predicted direction. Cohen's d is a descriptive measure not a test of statistical significance.

Effect sizes for *between-group* differences and within-group differences were calculated using the methods described by Cohen (1988), Morris (2008) and Friedmann et al. (2008). To characterise the between-group

magnitude of change over time, mean difference scores were calculated by subtracting the mean *estimated* change from baseline to follow-up for the treatment group from the mean estimated change from baseline to follow-up for the active-control group. Predicted values from the mixed linear regression analyses generated these difference scores. Then, the standard method was used to obtain Cohen's *d* treatment effect size by dividing the mean difference scores by the control group baseline standard deviation. For the *within-group*, an analogue of the paired *t*-test (as opposed to simple *t*-test for between-group) was used, obtaining the estimate of the within-group difference for group-one (for example) and its *t*-value to calculate Cohen's *d* directly. For repeated-measures data, this accommodates the variance conferred by the fixed effects versus random effects in the mixed-effects regression model. Effect size calculations and formulae are provided in the first worked example in the **Results**, p. 253). Effect sizes were interpreted as small ($d=0.20$), medium ($d=0.50$) or large ($d=0.80$).

5.14 Analysis overview: therapeutic effectiveness

5.14.1.1 Self-reported physical activity

The principal outcome of interest and the most proximal measure of the intervention's effectiveness was self-reported physical activity. It was hypothesised that participants in the experimental group would self-report higher levels of physical activity at the follow-up assessments as compared with active-control group participants. The effects of the interventions were tested by comparing within-group and between-group changes in IPAQ

scores at the four time-points. Physical activity was sectioned into three domains (1) Total physical activity per day (2) leisure time activity, and (3) sitting time inactive per day. These three domains were analysed separately. Statistical significance was determined at the $p \leq 0.05$ level. Mixed effects linear regression methods were employed for the analysis.

5.14.1.2 *Cardiorespiratory fitness*

Like self-reported physical activity, cardiorespiratory fitness (as measured by the Cooper 12 minute run/walk test) was an important outcome of interest. Changes in cardiorespiratory fitness reflect longer term activity levels more so than 7-day activity recalls. The effects of the interventions were tested by comparing within group and between-group changes in $VO_2\text{max}$ scores at the four time-points. Statistical significance was determined at the $p \leq 0.05$ level. Mixed effects linear regression methods were employed for the analysis.

5.14.1.3 *Health-related quality of life*

Health-related quality of life (HRQOL) as measured by the SF36v2 was the remaining primary outcome of interest. Changes in HRQOL reflected the participants' self-rated health status in the format of an 8-scale profile: physical function, role limitations due to physical problems (role-physical), role limitations due to emotional problems (role-emotional), vitality, bodily pain, social function, mental health, and general health. The generic SF36v2 measure's eight domains were aggregated (using the Quality Metric scoring software version 4.5™) to produce the two summary scores:

the physical component summary (PCS) and the mental component summary (MCS). Mixed effects linear regression methods were employed for the analysis. The effects of the interventions were tested by comparing within group and between-group changes in PCS and MCS scores at the four time-points.

5.14.2 Secondary outcome variables

5.14.2.1 Self-efficacy

The relationship between participants' levels of self-efficacy and physical activity over time was evaluated. In accord with the general findings of previous MI trials, it was proposed that participants' levels of self-efficacy (global and exercise specific via the GSE/ESE respectively) would be enhanced. The effects of the interventions were tested by comparing within group and between-group changes in GSE and ESE scores at the four time-points. Mixed effects linear regression methods were employed for the analysis.

5.14.2.2 Exercise stage of change

The Transtheoretical Model (TTM) (Prochaska & DiClemente, 1982) emphasises the temporal dimension of change and the idea of readiness. The effects of the interventions were examined by comparing between-group changes in participant's readiness for change at the four time-points. The methods detailed by Rossi (2000) were employed to present the findings (statistical significance tests were not applicable).

5.14.2.3 *Social support*

Social support as measured by the NSSQ assesses the functional properties of social support (e.g., emotional and tangible support), the network properties (e.g., stability of relationships, frequency of contact, total functional support), as well as eliciting descriptive data about recent losses of supportive relationships. Participants' baseline social support levels were an important potential confounder, therefore total functional support was included as a covariate in the mixed-effects models (not as an outcome or y variable).

5.14.2.4 *Sample size calculation for the IPAQ measure*

The physical activity goal of 30min per day of moderate intensity activity represents approximately a 2.0 kcal/kg/day difference. With a total of 60 participants entered in this two-treatment parallel-design study, the probability should have been 80% that the study would detect a treatment difference at a two-sided 5% significance level, if the true difference between treatments was 0.66 kcal/kg/day (or greater). This is based on the assumption that the standard deviation of the response variable would be 0.9 kcal/kg/day (or less).

5.14.2.5 *Sample size calculation for the Cooper 12min run test (VO₂max)*

With a total of 60 participants entered in this two-treatment parallel-design study, the probability would have been 80% that the study would detect a treatment difference at a two-sided 0.05 significance level, if the true

difference between treatments was 7.57 ml/kg/min (or greater). This is based on the assumption that the standard deviation of the response variable was 10.3 ml/kg/min (or less).

5.14.3 Qualitative data overview

Open response questions were included in the exit-survey administered to all participants at the 12-month follow-up assessment (along with other multi-choice items) (**Appendix A**). The questions were designed to elicit participants' subjective experience of the intervention programme and these written responses were analysed using thematic analysis. Thematic analysis involves the identification of prominent or recurrent themes in a text-based narrative (in this case the respondents written answers to the set of five questions) and summarising these under thematic headings (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2005; Miles & Huberman, 1994). Summary tables, providing descriptions of key points were produced for each of the five questions in the questionnaire. The subsequent integrative synthesis focused on summarising the data, rather than focusing on the development of higher order concepts or theories (Owen, 1984).

5.15 Summary

The general aim of this study was to design, implement and evaluate the effectiveness of a buddy-Motivational Interviewing intervention (buddy-MI) in assisting sedentary adults to adopt and maintain regular physical activity over a period of 12 months for the purpose of improving their

cardio-respiratory fitness, health and quality of life. It was hypothesised that such improvements would be demonstrated to a greater degree (at the 12-month follow-up assessment) by those participants in the experimental intervention group as compared to those participants receiving standard care. This hypothesis was tested by way of implementing a parallel group pragmatic randomised controlled trial. This study aimed to demonstrate the value of formally enlisting a social support person as a component of the health behaviour change counselling process. The following **Results** section outlines the main findings of the study.

6 RESULTS

6.1 Introduction

The Methodology Chapter outlined the study design, the specifics of the experimental intervention and the active control intervention, the various instruments and measures used, the method by which data were collected from the 60 study participants and how it was subsequently scored, collated and finally analysed. To briefly recap on the latter, the web-based questionnaires were processed to provide sub-scale scores that were then converted to individual participant summary-reports or profiles. **Table 16** (p.238) summarises the participants' baseline characteristics⁴¹. The individual participant's summary data were then entered into a Microsoft Excel[®] study data spread-sheet. Additionally, individual participant's long answer responses to the exit-survey questions were downloaded and collated for subsequent qualitative analysis. Results presented here were computed using the statistical analysis software 'R' (version 2013) utilising the 'lme4', 'psych', and 'languageR' packages (see **Appendix D** for a brief description of the R package features and specifications), which enabled the computation of all of the descriptive statistics, regression coefficients, estimates, confidence intervals and *p*-values as presented in this chapter. The graphs used for the presentation of data were generated using

⁴¹ An "*" appears to indicate where the average group differences are statistically significant ($p < .05$). These differences were subsequently adjusted for via statistical modelling.

Microsoft Excel[®] and the graphs of the model diagnostics were produced in R and are included in **Appendix D**.

This Results Chapter comprises three distinct sub-sections, namely the descriptive results including the socio-demographic and clinical profiles of the participants (p.232), the 'effectiveness' results from the mixed-effects linear regression modelling beginning with one fully worked example (p.239) and finally the qualitative findings derived from the exit surveys (p.282).

6.2 Descriptive Statistics: socio-demographic and clinical profiles

It was not feasible to stratify the sample for gender, age or ethnicity but block-randomisation was used to achieve participant groups of equal size. As a result, the groups were not balanced. These differences (in some cases statistically significant differences), and the repeated-measures structure of the data, meant that statistical modelling techniques were required to adjust the parameter estimates. These between-group differences and their implications are fully described in the **Discussion**.

6.2.1 Gender

Sixty individuals entered the trial. Exactly three quarters of the participants were female and one quarter male as can be seen in **Figure 16**.

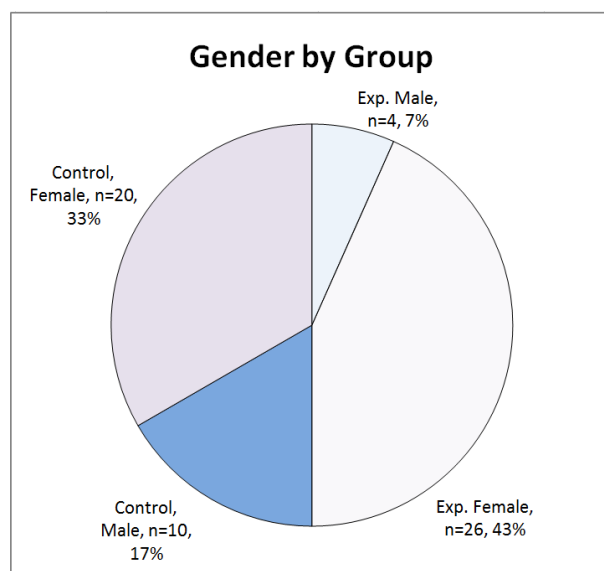


Figure 16: The distribution of gender by group for the 60 study participants

The experimental group comprised four males and 26 females and the control group ten males and 20 females (overall, females outnumbered males in the trial 75%: 25%)⁴². By group, females outnumbered males 2:1 in the control group and 6:1 in the experimental group. This difference in the between-group ratio occurred partly due to chance, but also due to six male participants withdrawing between randomisation to the experimental group and the first scheduled appointment.⁴³ Only three participants failed

⁴² These differences were statistically significant ($p < 0.05$) and were corrected in the statistical modelling.

⁴³ 55 respondents (31 male, 24 female) were excluded from study entry: 28 respondents (16 female; 12 male) declined after reading the full study details and disclosures (of which 9 people stated it was because of the potential to include the buddy component and 6 (all males) of these withdrew after randomisation but before treatment), 9 respondents were scheduled to return overseas during the

to return questionnaire responses beyond one month (95% retention; two from the experimental group and one control group participant). These three participant's incomplete data were included in the analysis in accordance with the intention-to-treat (ITT) analysis plan and as such missing data generally have *not* been extrapolated by last observation carried forward, or by any other means.

6.2.2 *Ethnicity*

Fifty participants (83 %) chose New Zealand European to describe their ethnic origin, two participants chose Māori, one participant Eastern European, one Samoan, one Niuean and nine Other. The sample was essentially representative of the population from which the participants were drawn (rather than the New Zealand general population necessarily).

6.2.3 *Age*

There was a minimum age criteria only (17 years) in this self-selected whole-university/polytechnic population sample (to capture both UC and CPIT students in addition to staff). The age of the participants ranged from 17 years to 55 years with a mean of 33.25 years (SD 12.06) (**Figure 17**). In the control group the mean age was 29.7 years (SD 8.65) and in the experimental group 36.8 years (SD 13.96).⁴⁴ In addition to the staff members (n=9) tending to be older, there was a fairly high proportion of

study period, 11 respondents reported being too active already or had no issues with motivation, and 10 respondents never replied to two successive email prompts and reminders.

⁴⁴ This difference was significant (two-sample t-test; $p=0.032$) and corrected in the statistical modelling..

post-graduate students within the sample and this resulted in the average age being rather higher than might be expected for a random student population. Again, it was not feasible to stratify the sample by age and randomisation of the relatively small sample failed to fully control for this variation.

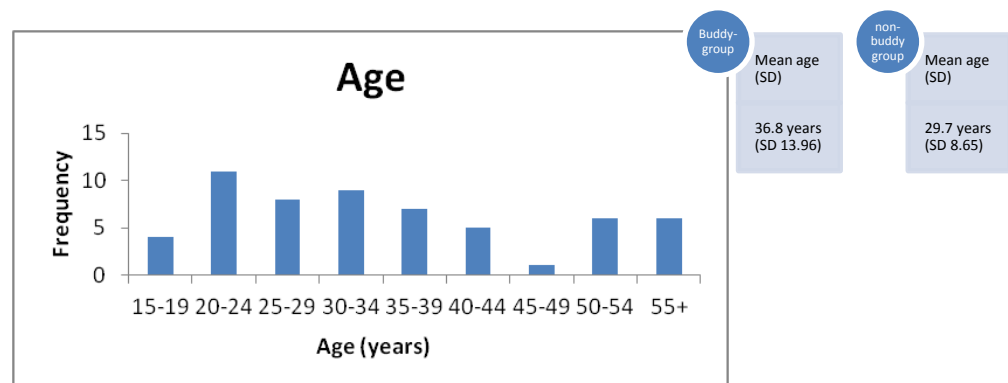


Figure 17: The age distribution of the sample (n=60)

6.2.4 Physical limitations

In total, seven participants (11.6 %) reported during recruitment screening or during the course of the study that they had a medical or other condition that prevented them from undertaking physical activity completely without restriction, to the level that they would like. Five of these participants (8.3%) were in the experimental group and two (3.3%) were in the control group. These seven participants reported that their physical limitations would not/did not prevent them from engaging in some form of appropriate physical exercise but that it was not necessarily the form and/or level they otherwise would have chosen. These limitations included three cases of pre-existing musculoskeletal injuries, two cases of orthopaedic surgery

during the course of the study and two women became pregnant between their respective 3-month and 12-month follow-ups. The group allocation was such that more participants with a physical limitation were in the experimental group (5:2) and this would tend to dilute the effect size not increase it (although this possible confounding effect was included in the statistical model). The inclusion of participants with physical limitations reflects 'real world' conditions and is consistent with the pragmatic design of the programme.

6.2.5 Smoking status

Only one participant (allocated to the experimental group) reported that they currently smoked cigarettes and this participant quit before the end of the study. Therefore, smoking status was not included in any analysis.

6.2.6 Body-Mass and BMI

All participants in the study self-reported their height and their weight at the four time-points and individual's BMI was subsequently calculated (**Figure 18**). Mean body mass at baseline was (exp) 76.92kg (SD 18.88kg range 54.5-116 kg) and (control) 75.87 kg (SD 16.31kg range 52.5-112 kg). For the experimental group, mean body mass at 12-month follow-up was 72.8kg (SD 16.1kg, range 54-108kg) and for the control group at 12-months 74.37 kg (SD 15.2kg, range 52.5-109kg). Overall the participants in the experimental group lost on average 4.1kg over the course of the study and the control participants 1.5kg however this between-group difference

was not statistically significant (group mean body mass reduced by 2.84kg).⁴⁵

BMI was calculated using the formula $\text{BMI} = \text{body mass (in Kilograms)} / \text{height}^2$ (in meters). With respect to baseline BMI, over half (58%) of the participants were in the normal range (18.5-24.9 kg/m²) with the remaining participants being either overweight (18%; 25-29.9kg/m²) or obese/morbidly obese (23%; 30-34.9 and 35+ kg/m² respectively). There was a very large range of BMI values (19-43.3kg/m²) and taken together, the participants' average BMI was 26.7kg/m² and therefore the group can be generally considered as overweight. Overall BMI reduced 1.3kg/m² over the 12-months of the study however the between-group difference (0.04kg/m²) was not statistically significant.

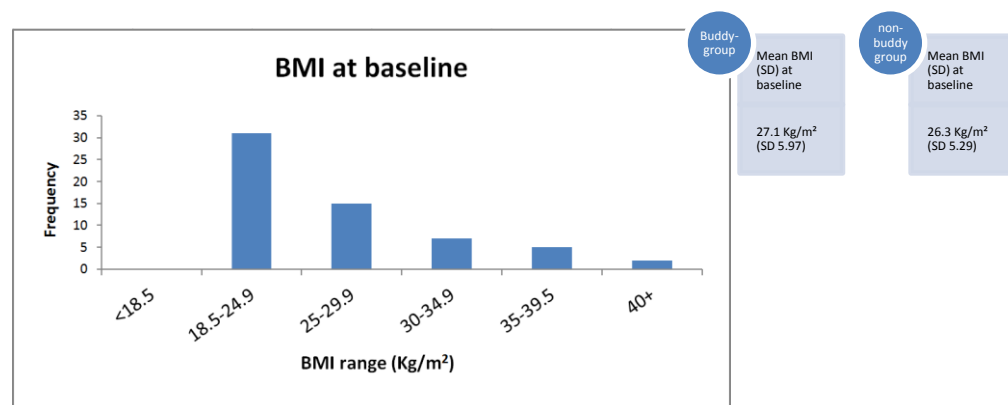


Figure 18: Participants' BMI at baseline (n=60)

⁴⁵ The size of this between-group difference is probably clinically significant but the effect size is probably masked by the high variability in weight (high SDs).

Table 16: Participants' baseline characteristics

Parameter	Summary	Control (Group 2)	Buddy (group 1)	Total
*Age (years)	n	30	30	60
	mean (SD)	29.7 (8.65)	36.8 (13.96)	33.25 (12.06)
	range	37	38	38
*Gender	Male (%/30)	10 (33.3)	4 (13.3)	15(25% of 60)
	Female (%/30)	20 (66.3)	26 (86.6)	45(75% of 60)
*Weight (Kg)	n	30	30	60
	mean (SD)	75.87 (16.31)	76.92 (16.88)	76.39 (16.46)
	range	74.5	61.5	74.5
*BMI (Kg/m2)	n	30	30	60
	mean (SD)	26.25 (5.29)	27.11 (5.97)	26.68 (5.56)
	range	21.1	24.3	24.3
*Initial fitness (VO2max)	n	28	28	56
	mean (SD)	30.55 (13.97)	23.66 (9.8)	27.1 (12.45)
	range	48.7	45.4	52.3
Start season (n)	range	4	3	4
	Summer	14	17	31
Transport cycling (min/day)	Winter	16	13	29
	n	28	29	57
	mean (SD)	3.68 (11.31)	3.31 (8.62)	3.49 (9.94)
Transport walking (min/day)	range	57	43	57
	n	28	29	57
	mean (SD)	12.86 (18.61)	10.03 (13.02)	11.42 (15.93)
Leisure walking (min/day)	range	77	51	77
	n	28	29	57
	mean (SD)	8.82 (15.95)	8.9 (20.06)	8.86 (17.99)
Sitting (hours/day)	range	77	99	99
	n	28	29	57
	mean (SD)	7.69 (2.87)	7.8 (2.7)	7.72 (2.76)
Volitional moderate PA (min/day)	range	10.2	11.4	11.4
	n	28	29	57
	mean (SD)	13.46 (20.98)	12 (22)	12.67 (21.43)
Volitional vigorous PA (min/day)	range	86	90	90
	n	28	29	57
	mean (SD)	7.29 (9.08)	5.6 (7.9)	6.44 (8.49)
*Total volitional moderate equivalent (min/day)	range	29	29	29
	n	28	29	57
	mean (SD)	45.89 (38.89)	38 (44)	42.19 (41.43)
*Total PA (met-min/day)	range	137	213	213
	n	27	29	56
	mean (SD)	267 (163)	239 (188)	253 (175)
Self-efficacy	range	595	843	843
	n	30	30	60
	mean (SD)	30.93 (3.9)	29.5 (4.66)	30.22 (4.34)
Exercise self-efficacy	range	16	19	19
	n	30	30	60
	mean (SD)	10.47 (2.91)	9.73 (2.96)	10.1 (2.93)
Physical health score	range	11	12	12
	n	30	30	60
	mean (SD)	52.68 (7.14)	53.48 (7.17)	53.08 (7.1)
Mental health score	range	31.91	32.71	36.35
	n	30	30	60
	mean (SD)	41.79 (9.85)	43.69 (10.93)	42.74 (10.36)
Social support-Total functional	range	36.3	50.24	50.24
	n	30	30	60
	mean (SD)	135 (77)	178 (68)	156 (76)
	min	37	56	37
Number of treatment sessions	max	335	310	335
	range	298	254	298
	n	30	30	60
Number of treatment sessions	mean (SD)	2.27 (0.69)	2.17 (0.65)	2.22 (0.67)
	min	2	2	2
	max	4	4	4
	range	3	3	3

Table 16: Participants' baseline characteristics (continued)

	n	30 (Control)	30 (Buddy)	60
Number of email contacts	mean (SD)	17.83 (6.85)	16.57 (7.67)	17.2 (7.24)
	min	7	7	7
	max	39	36	39
	range	32	29	32
Buddy quality (exit survey)	n	N/A	26	N/A
	Good		21 (70%)	
	Poor		5 (16.6)	
	No rating		4 (13.3)	
Buddy empathy score		N/A	n = 24	N/A
			2.1 (1.95)	
*Physical limitation	Yes (%)	n = 2 (3.3%)	n = 5 (8.3%)	n = 7 (11.6 %)

* Indicates where the average between-group differences are statistically significant at the $p < .05$ level. These variables were subsequently included into the statistical models as predictor variables (covariates) and the outcomes (parameter estimates) are therefore 'adjusted' accordingly.

6.2.7 Statistical modelling: example *FITNESS*

In this analysis, the focus was on both accurate prediction of the parameter estimates (adjustments to the data) as well as the focus on the regression coefficients themselves (to quantify the strength of any relationship between y and the x -variable(s) and to assess which x -variable(s) are/are not related to y). It is important to be mindful from the onset that regression is a study of association, not causality. The study design allowed for measuring participants progress over time as compared to a more simple before-and-after design. The resultant repeated measures data consists of multiple profiles (in this case of people's health outcomes) across four fixed time-points⁴⁶.

Mixed-effects linear regression can be used for the accurate prediction of parameter estimates (y -variables), or in other words, adjustments to the data given (or accounting for) the influence of selected predictor or explanatory

⁴⁶ Time-series studies by contrast typically record a smaller amount of data over a long time.

variables (x -variables). Mixed-effects linear regression can account for all of these x -variables at once, as they relate to y , within one model. For example, mixed-effects linear regression can model the change in a participants level of daily physical activity given the particular type of physically activity counselling they received (the experimenter manipulated exposure or treatment) as well as all of the co-occurring variables such as age, gender, body weight, and more.

Generally the principle of parsimony applies to the specifying of a predictive model, that is, consideration should be given to the selection of variables such that the simplest plausible model with the fewest possible number of variables can be formulated⁴⁷. Multicollinearity refers to the case where some variables are near or exact linear combinations of other variables contained within the model and so give rise to some degree of redundancy. Appropriate consideration was given to the background science, the data, and the included variables to avoid such redundancies and the unreliable estimates of regression coefficients that may result (Maindonald & Braun, 2007; Raudenbush & Bryk, 2002).

6.2.8 Statistical method: mixed-effects modelling

The following section further describes the statistical analysis, by first presenting one full and completely detailed example (for the y -variable FITNESS) then by presenting the remaining results in a concise summary

⁴⁷ The implications here are more to do with resources and planning future data collection (and handling large amounts of data) rather than working with existing and relatively small data sets.

format. The outcome FITNESS was selected for this example because it was the one *objectively* measured (single blind) primary outcome, and because the concept of physical fitness is easily understood. However, any of the outcomes could have been used in this fully worked example. Throughout this example, all actual *R code* appears within red boxes and is followed by an *interpretation* (grey boxes), and actual *R output* appears within blue boxes.

The outcome FITNESS represents participant's test scores on the Cooper 12-minute run test (Cooper, 1968), a sub-maximal running/walking test designed to assess individuals' aerobic fitness. The distance result from the Cooper test is converted to *maximum oxygen consumption* or VO_2max (measured in $\text{mlO}_2/\text{min}/\text{kg}$).

In the statistical software 'R', using the package lmer4, the model is specified by a formula argument. The mixed-effects model (**Equation 1**) estimates the expected values for FITNESS across time when controlling for the following *x*-variables: gender, season, baseline BMI, baseline sitting hours per day, baseline self-efficacy and exercise self-efficacy, baseline social support, baseline physical limitations, baseline physical and mental health, baseline fitness and group. These variables can be seen on the right-hand side of **Equation 1** (separated by the '+' sign). These are the 'fixed effects' terms (see p.219 for a discussion of fixed vs. random effects). The random-effects term (1|ID) is used to inform the model of the repeated

measures structure of the data (four measurements taken for each individual).

```
m1<-lmer(FITNESS~  
Age+as.factor(Gender)+as.factor(Season)+BMIBase+SDHavbase+SelfEb  
ase+ExSelfEbase+TLFUNCT+as.factor(PL)+MCSbase+PCSbase+FITN  
ESSbase+as.factor(Time)*relevel(as.factor(Group),'2')+(1|ID), data=dat)
```

Equation 1: Model 'm1' for the outcome variable FITNESS

Interpretation

The model formula consists of two expressions separated by the ~ symbol. The expression on the left, typically the name of a variable, is evaluated as the response. The right-hand side consists of one or more terms separated by '+' symbol or '*' for interactions. A random-effects term consists of two expressions separated by the vertical bar, '|', symbol (read as "given" or "by"). Typically, such terms are enclosed in parentheses. The expression on the right of the '|' is evaluated as a factor, and is called the grouping factor for that term. The expression on the left of '|' is frequently (and in this case) '1' indicating that a simple scalar random effect for each level is evaluated as a model matrix. The random-effects term (1|ID) is used to inform the model of the repeated measures structure of the data (four measurements taken for each individual). The default parameter estimation criterion for linear mixed models is restricted (or residual) maximum likelihood (REML) (Bates & Maechler, 2010).

6.2.9 Model diagnostics

The lme4 mixed effects models handle missing data and unequal group sizes well; however it is still necessary to run diagnostic checks on the data for normality of residuals and the estimated random effects. The Quantile-Quantile plots (Q-Q plots) in **Figure 19** (below) show if the residuals are normally distributed as indicated by their deviation from the Q-Q line and this is a combination of the particular model and the particular dataset. The Q-Q plot is used to see if a given set of data follows some specified distribution. It should be approximately linear if the specified distribution is the correct model. The values in the sample of data, in order from smallest

to largest, are plotted against the specified distribution (Gaussian). The diagnostics are run with the following R code shown in **Equation 2**.

```
par(mfrow=c(2,2))
plot(fitted(m1),resid(m1)) # tunnel
qqnorm(resid(m1)); qqline(resid(m1),col='red')
plot(ranef(m1)$ID[[1]])
qqnorm(ranef(m1)$ID[[1]]); qqline(ranef(m1)$ID[[1]],col='red')
```

Equation 2: R code for the ‘m1’ diagnostics

Interpretation

Instructs R to plot a 2x2 array of the relevant diagnostic QQ plots

The R programme produces a 2x2 display of the diagnostics: normal Q-Q plots, factor versus residual plots, residual versus fitted value plots. In addition, R calculates the ‘explained variation’ or R^2 for the model using the “my.r2” function. The model is fitted without any covariates (fixed effects only) using the standard formula. R^2 for model (m1) FITNESS =0.363⁴⁸. R^2 was calculated for each of the primary variables and appears alongside the diagnostics in each case (**Appendix D**).

⁴⁸ In any field that attempts to predict human behaviour, such as psychology, R-squared values are expected to be low (typically R-squared values lower than 50%). The remaining % is due to individual variation and might be explained by other factors that were not taken into account in the analysis. However, regardless of the R-squared, the significant coefficients still represent the mean change in the response for one unit of change in the predictor while holding other predictors in the model constant (Xu, 2003).

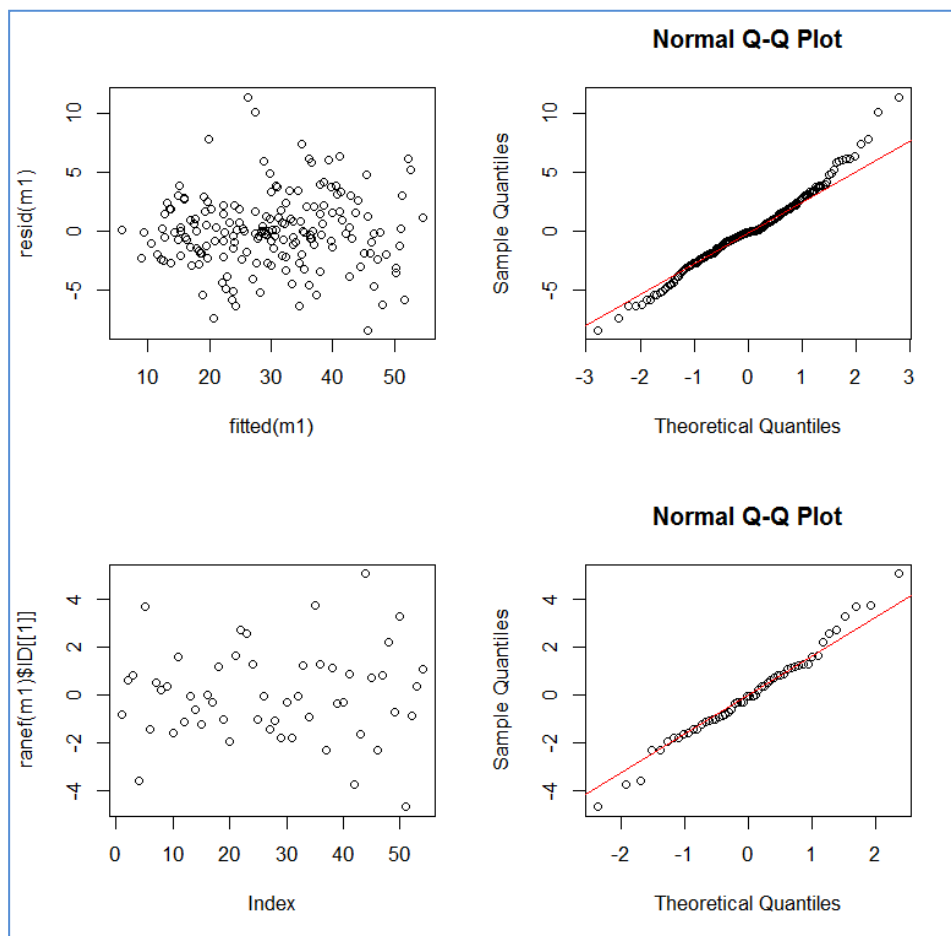


Figure 19: Diagnostic plots for the outcome variable FITNESS: normality of residuals and the estimated random effects.

The plots for "FITNESS" demonstrate no problems with misspecification (no patterns in the left-hand plots), no heteroscedasticity (funnels), and no marked deviations from normality (right hand plots).

Model m2 (FITNESS)

This mixed effects model 'm2' (**Equation 3**) estimates the expected values for FITNESS across time when controlling for the same x-variables as previously but *not* the interaction term “Time*group”. The purpose of m2 demonstrated below: an ANOVA is run (m1,m2) testing for interaction between Time and Group, that is, whether the difference between the two groups changes in time. Therefore this is not a test of difference between groups; it is a test of difference between differences between groups.

```
m2<-lmer(FITNESS~  
Age+as.factor(Gender)+as.factor(Season)+BMIbase+SDHavbase+SelfEbase+ExSelfEbase+TLFUNCT+as.factor(PL)+MCSbase+PCSbase+FITNESSbase+as.factor(Time)+relevel(as.factor(Group),'2')+(1|ID), data=dat)  
  
anova(m1,m2)
```

Equation 3: Model 'm2' adjusts for selected x-variables without the time-group interaction term of 'm1'

Interpretation

Model m1 (Equation 1) includes the term “Time*Group” and m2 (Equation 3) includes the term “Time+Group” therefore the ANOVA is testing for interaction between Time and Group, that is, whether the difference between the two groups changes in time. In this case, apparently not given by $p = 0.4357$. Therefore this is not a test of difference between groups; it is a test of difference between differences between groups. Apparently, for this particular outcome variable FITNESS, the difference between treatment and control stays the same over time and this is consistent with Figure 21 below (p.246).

Then, performing an ANOVA on the two models 'm1' and 'm2' returns model comparison statistics (**Figure 20**).

	Df	AIC	BIC	logLik	Chisq	Chi	Df	Pr(>Chisq)
m2	19	1077.2	1138.5	-519.63				
m1	22	1080.5	1151.5	-518.26	2.7265		3	0.4357

Figure 20: R output of the model comparison statistics for anova (m1,m2)

6.2.9.1 Model summary statistics

Next, the 'summary' function (summary (m1)) is run to produce the summary statistics for the model 'm1', and the R output.

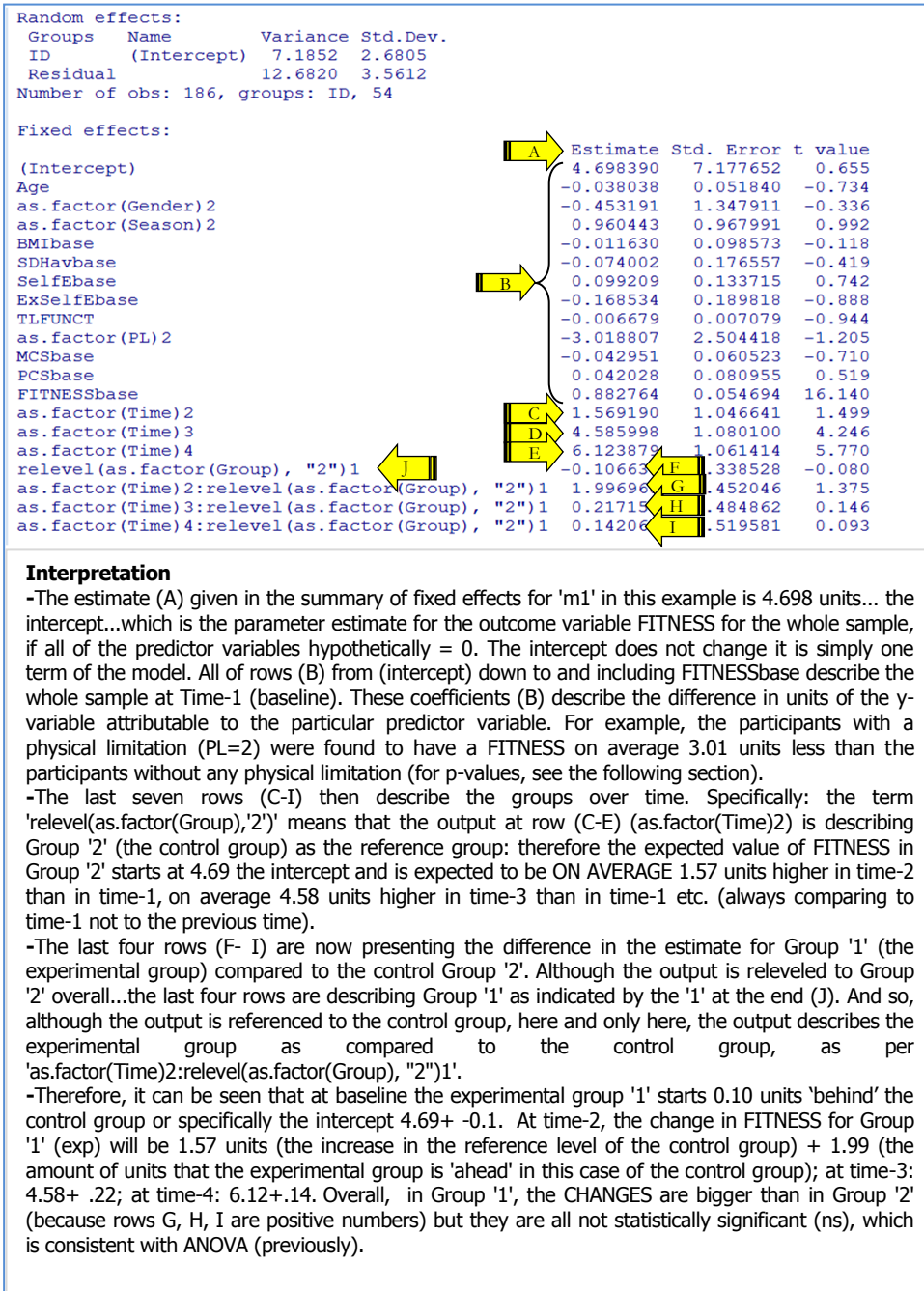


Figure 21: R summary output and interpretation for the outcome FITNESS

For all participants (186 of 240 possible observations from 54 of 60 participants, indicating some missing data)

6.2.10 Regression coefficients and p-values

The focus of the next analysis is on the regression coefficients themselves (to quantify the strength of any relationship between y and the x - variable(s) and to assess which x -variable(s) are/are not related to y). This extends to the changes in the y -variable (in this case FITNESS) over time. The previous function 'summary' of 'm1' does not produce p -values and these need to be computed separately using the 'pvals' function in the package LanguageR which uses Markov chain Monte Carlo methods (MCMC). The output presented below (Figure 22, p.248) has been cropped and only the columns that are relevant here have been presented for clarity.

```
m1<-lmer(FITNESS~  
Age+as.factor(Gender)+as.factor(Season)+BMIBase+SDHavbase+SelfEb  
ase+ExSelfEbase+TLFUNCT+as.factor(PL)+MCSbase+PCSbase+FITN  
ESSbase+as.factor(Time)*relevel(as.factor(Group),'2')+(1 | ID), data=dat)  
  
(my.pvals<-pvals.fnc(m1))
```

Equation 4: Model 'm1' and the p-values function using the package LanguageR

Interpretation

The same model m1 (Equation 1) with the additional command line (my.pvals<-pvals.fnc(m1)). This returns the p -values for regression coefficients themselves as per Figure 22.

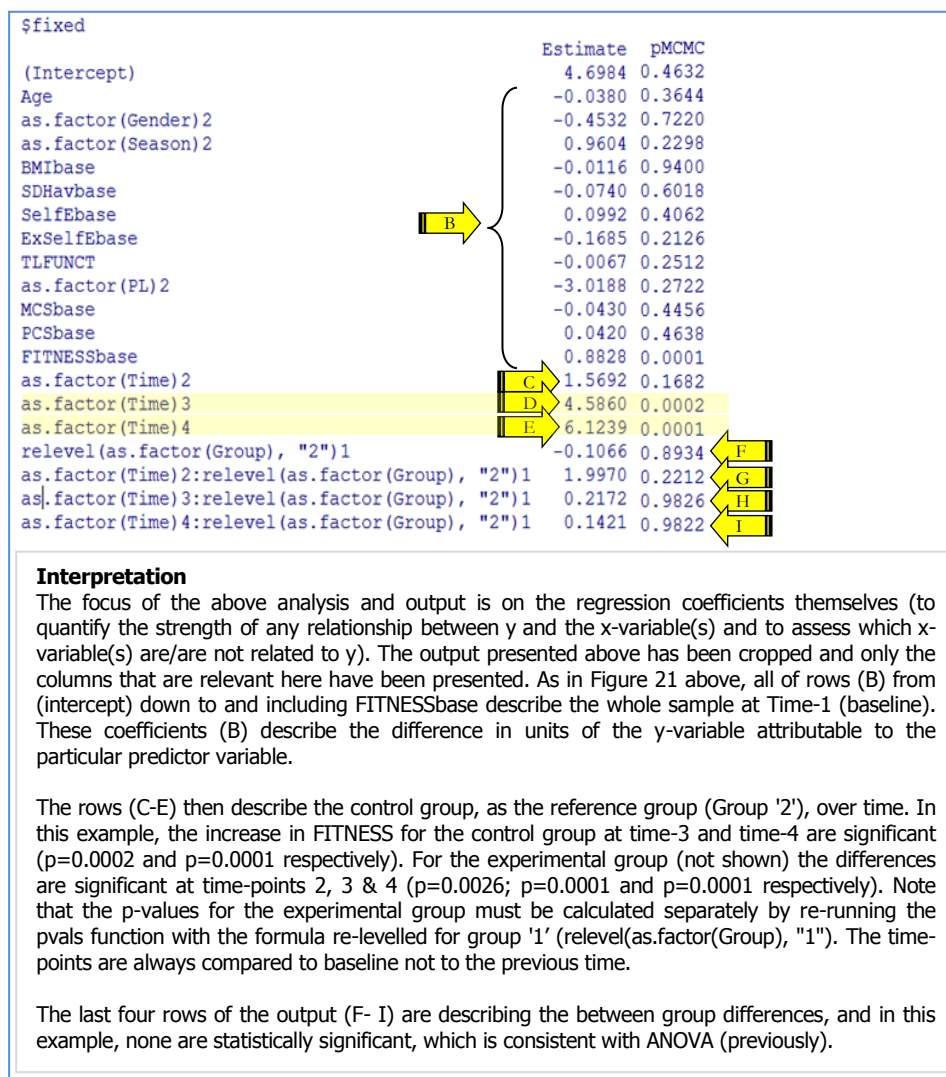


Figure 22: R output for the y-variable FITNESS with regression coefficients and MCMC p-values

6.2.11 Point estimates and confidence intervals

The next procedures focus on the estimates or *adjustments* to the data for the purpose of estimating the ranges of response variable values that the treatment could potentially generate in the population as a whole (see Loe, Rognmo, Saltin, & Wisloff, 2013 for a full discussion of aerobic capacity with reference data). These estimates and their associated 95% confidence intervals (95% CIs) are then plotted to represent the treatment effect.

Parameter estimates and 95% CIs are calculated using the 'pval.fnc()' from the package languageR. In this example, the output provides the parameter estimate (and 95% CI) of the variable FITNESS for a typical or nominal person across the four time points of the study. Unlike the estimate given in the summary of 'm1' (4.698 units, which is the parameter estimate for FITNESS when all of the predictor variables hypothetically = 0), the estimate given here (and the 95% CIs) are for a nominal person of specified baseline age, gender, BMI, fitness (etc). The values are specified such that the adjustments to the estimate are being made to a simulated or *reference* person, as specified by existing population norm data or other published scale norms (where available) or by convention. The assigned reference values can be seen in **Equation 5**⁴⁹.

```
>m1<-lmer(FITNESS~
0+as.factor(Time)*relevel(as.factor(Group),'2')+I(Age-
33)+as.factor(Gender-1)+as.factor(Season-2)+I(BMIbase-
25)+I(SDHavbase-8)+I(SelfEbase-30)+I(ExSelfEbase-12)+I('TLFUNCT'-
150)+as.factor(PL-1)+I(MCSbase-50)+I(PCSbase-50)+I(FITNESSbase-
45)+ (1 | ID), data=dat)
> pvals.fnc(m1)$fixed[1:4,]
```

Equation 5: To estimate the expected FITNESS levels for Group-2 (control).

Interpretation

Model m1 from Equation 1 (previously) is now developed further to include the nominated reference values for each predictor variable. The character capital 'I' in the formula is a programming instruction used for calculating variables within the body of the model.

⁴⁹ The predictor variable 'TLFUNCT' (total social support) was only measured at baseline and was not significantly related to FITNESS or any other outcome and is not reported further.

Note that the Markov chain Monte Carlo (MCMC) p -values provided here are completely meaningless, because they are only reporting that the FITNESS estimates are different from zero (which is already known), so they are not reported in this table (appearing below in **Figure 23** in strikethrough font for demonstration only). Tables of unadjusted means can be found in **Appendix D**. Firstly for the control group '2' the parameter estimates and 95% confidence intervals ...

	Estimate	HPD95lower	HPD95upper	pMCMC
as.factor(Time)1	42.66	40.15	45.43	0.0001
as.factor(Time)2	44.23	41.63	47.32	0.0001
as.factor(Time)3	47.25	44.39	50.10	0.0001
as.factor(Time)4	48.78	46.14	51.69	0.0001

Figure 23: R output for the control group, estimates and 95% CIs

Interpretation

Figure 23 shows the R output for the control group: in this example, the estimated average fitness level and 95% confidence intervals for the variable FITNESS (VO₂max). This is the 'adjusted' estimate of FITNESS and it can be seen to be increasing steadily over the four time-points. Individuals' aerobic fitness varies significantly and there are known gender and age differences. Loe et al. (2013) recently published reference data from a large objectively measured sample: in the 20-90yr age group the mean aerobic capacity was 41.36 (\pm 9.2) mL/kg/min and women had 18.7% lower VO₂max than men. Over the 20-50yr age groups a 6% reduction in VO₂max per decade was observed and after the age of 50yrs an 8% reduction per decade was observed. Therefore, the estimates presented here are necessarily adjusted for age and gender as well as several other predictor variables (e.g. the reference values are age=30; gender=male; BMI=23 etc as listed in Equation 6 below). Here, in the case of the variable FITNESS (and also for most all of the other y variables) the focus of the analysis is on demonstrating *within-group* and *between-group* changes over time, rather than it being on predicting 'absolute' y values.

...and then for the experimental group '1',

```
>m1<-lmer(FITNESS~
0+as.factor(Time)*revel(as.factor(Group),'1')+I(Age-
30)+as.factor(Gender-2)+as.factor(Season-2)+I(BMIbase-
23)+I(SDHavbase-8)+I(SelfEbase-30)+I(ExSelfEbase-10)+I(TLFUNCT-
150)+as.factor(PL-1)+I(MCSbase-50)+I(PCSbase-50)+I(FITNESSbase-
45)+ (1 | ID), data=dat)
> pvals.fnc(m1)$fixed[1:4,]
```

Equation 6: To estimate the expected FITNESS levels for the Group-1 (exp.)

...and the output...

	Estimate	HPD95lower	HPD95upper	pMCMC
as.factor(Time)1	42.55	39.75	45.31	0.0001
as.factor(Time)2	46.12	43.34	48.97	0.0001
as.factor(Time)3	47.36	44.38	50.23	0.0001
as.factor(Time)4	48.82	45.74	51.78	0.0001

Figure 24: R output for the experimental group, estimates and 95% CIs

6.2.12 Calculating *p*-values for Control vs. Treatment

The following *p*-value formula is then run to produce results (releveled for group '2') without the intercept. This produces coefficients which directly reflect differences between *control* and *treatment* at each time point, and thus *p*-values.

```
pvals.fnc(m1)$fixed[c(5,18:20),]
```

Equation 7: *p*-values for 'm1' run without the intercept

	Estimate	95lower	95upper	pMCMC
relevel(as.factor(Group), "2")1	-.1066	-2.7082	2.1763	0.8944
(Time)2:relevel(as.factor(Group), "2")1	1.9970	-1.1914	5.1912	0.2110
(Time)3:relevel(as.factor(Group), "2")1	0.2172	-3.1500	3.2228	0.9896
(Time)4:relevel(as.factor(Group), "2")1	0.1421	-3.2945	3.3471	0.9624

Figure 25: R output for the variable FITNESS with *p*-values for differences between the control vs. experimental groups

Interpretation

Figure 25 shows the R output for the between-group differences: in this example, the estimated average fitness level (FITNESS) was not statistically different between the groups at any of the four time-points.

6.2.13 Graphs of the estimates with 95% CIs (e.g. FITNESS)

All graphs were plotted in Microsoft Excel™ as scatter plots with custom error bars using values calculated from the 95% CIs as upper and lower ‘distance’ away from the estimates. The *x*-axis coordinates of the control group are plotted 0.05 time units ‘ahead’ of the experimental group to

visually separate the 95%CI lines. **Figure 26** illustrates participants' FITNESS over the four time points (see also **Table 17**).

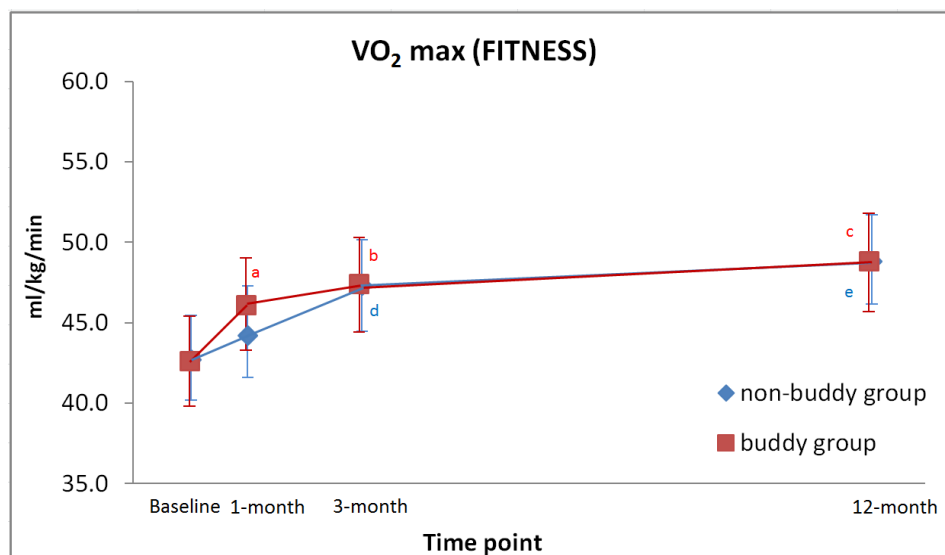


Figure 26: Estimated average fitness level and 95% confidence intervals (FITNESS)

FITNESS (cardiovascular fitness as estimated from the Cooper 12-min fitness test and presented as maximum oxygen consumption, VO2max, measured in mlO2/min/kg) was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. In this example, the estimated average fitness level (FITNESS) was not statistically different *between* the groups at any of the four time-points.

a: the exp. group estimate for FITNESS at one-month was statistically different from baseline ($p=0.026$)

b: the exp. group estimate for FITNESS at three-months was statistically different from baseline ($p=0.001$)

c: the exp. group estimate for FITNESS at 12-months was statistically different from baseline ($p=0.001$)

d: the control group estimate for FITNESS at three-months was statistically different from baseline ($p=0.002$)

e: the control group estimate for FITNESS at 12-months was statistically different from baseline ($p=0.001$)

Table 17: Estimated average fitness level

Variable	Baseline	1-month	3-month	12-Month
FITNESS	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	42.7	44.2	47.2	48.8
Buddy-group (TRT)	42.5	46.1	47.3	48.8

6.2.14 Effect size: (e.g. FITNESS)

6.2.14.1 Within group effect sizes

For the *within-group* effect size, an analogue of the paired *t*-test (as opposed to simple *t*-test for between-group) was used. The value of the *t*-statistic (of the test of difference between the two time-points) was used to calculate Cohen's *d* directly (Equation 8) (Cohen, 1988; Rosenthal & Rosnow, 1991) (see **Table 28**, p.275 for a guide to interpreting Cohen's *d*). For repeated-measures data, this accommodates the variance accounted for by the fixed effects vs. random effects in the mixed-effects regression model. The *t*-value is obtained directly from the R summary output firstly for the control group (the reference group-2). To obtain the *t*-value for the experimental group, the output must then be releveled to group-1, in a similar way as described previously when calculating the parameter estimates and 95% CIs (e.g. **Equation 6**).

Random effects:			
Groups	Name	Variance	Std.Dev.
ID	(Intercept)	7.1852	2.6805
Residual		12.6820	3.5612
Number of obs: 186, groups: ID, 54			
Fixed effects:			
	Estimate	Std. Error	t value
(Intercept)	4.698390	7.177652	0.655
Age	-0.038038	0.051840	-0.734
as.factor(Gender) 2	-0.453191	1.347911	-0.336
as.factor(Season) 2	0.960443	0.967991	0.992
BMIbase	-0.011630	0.098573	-0.118
SDHavbase	-0.074002	0.176557	-0.419
SelfEbase	0.099209	0.133715	0.742
ExSelfEbase	-0.168534	0.189818	-0.888
TLFUNCT	-0.006679	0.007079	-0.944
as.factor(PL) 2	-3.018807	2.504418	-1.205
MCSbase	-0.042951	0.060523	-0.710
PCSbase	0.042028	0.080955	0.519
FITNESSbase	0.882764	0.054694	16.140
as.factor(Time) 2	1.569190	1.046641	1.499
as.factor(Time) 3	4.585998	1.080100	4.246
as.factor(Time) 4	6.123879	1.061111	5.770
relevel(as.factor(Group), "2") 1	-0.106630	1.331111	-0.080
as.factor(Time) 2:relevel(as.factor(Group), "2") 1	1.996968	1.452043	1.375
as.factor(Time) 3:relevel(as.factor(Group), "2") 1	0.217159	1.484862	0.146
as.factor(Time) 4:relevel(as.factor(Group), "2") 1	0.142060	1.519581	0.093

Figure 27: R summary output for the outcome FITNESS (Group 1)

Interpretation

Figure 27 again shows the R output for the variable FITNESS: in this example, arrow "A" indicates the t-value for the test of the difference in the estimated average fitness level (FITNESS) for the control group (the control group is the reference) at time four (i.e. time four compared to baseline). This value is used directly in Equation 8 below. Using this t-value satisfies the need to account for the fact that the data are correlated (i.e. the same individuals measured over time). To obtain the t-value for the experimental group (group 1), the output must be releveled to group-1 in a similar way as previously in Equation 6.

$$d = 2t / \sqrt{df}$$

or (when the 'n's differ from baseline to follow-up)

$$d = t(n_1 + n_2) / [\sqrt{df} \sqrt{(n_1 n_2)}]$$

Equation 8: Calculating Cohen's d using the t-statistic

Within-group effects were apparent and for the non-buddy group the baseline estimate for FITNESS was 42.66 units (SD 13.97) and at follow-up, 48.79 units (SD 13.24) ($t = 5.770$) and the effect size, Cohen's $d = 1.54$. For the buddy group the baseline estimate for FITNESS was 42.55 units (SD 9.8) and at follow-up, 48.82 units (SD 9.7) ($t = 5.782$) and the effect size, Cohen's $d = 1.55$ (see **Discussion** for implications).

6.2.14.2 *Between-group effect size*

The *between-group* effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up (**Equation 9**). In this example (FITNESS) the between group effect size is negligible ($d = 0.0024$) because, as can be seen in **Figure 26**, there is no between-group difference (48.8 vs. 48.8) at 12-months (although a small difference was apparent at one-month).

$$d = M_1 - M_2 / \sigma$$

where

$$\sigma = \sqrt{[\sum(X - M)^2 / N]}$$

Equation 9: Cohen's d for between group effect sizes

Both groups progressively increased their cardiovascular fitness out to the 12-month follow-up. The increase of approximately 5.7ml/O₂/kg was

clinically significant (representing the fitness gain that would approximate a reduction in 10k running time for example from 60min to 52min), and statistically significance at one-month, three-months and 12-months for the experimental group and at three and 12-months for the control group. However, between-group differences were not significantly different at any time-point. The buddy-group reported slightly higher cardiovascular fitness at one-month as compared to the non-buddy control group but again this difference was not statistically significant and it had diminished by the three-month follow-up. While the presence of a physical limitation or injury did attenuate the fitness gains made by some participants, participants with physical limitations or injury did on average still make some increases to their fitness (see also the results for leisure time physical activity). Also, being fitter at baseline conferred a small advantage, as the fitter participants appeared to benefit slightly more from the motivational intervention than the less fit ($p=0.0001$).

6.2.15 Physical activity

The International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003) was used to assess participants' levels of physical activity across the four time-points. Physical activity comprises a complex set of behaviours that include habitual active commuting, recreational activities such as gardening, and more purposeful exercise activities such as gym-based exercise and sport. The IPAQ provides sub-scales in these domains as well as a record of time spent sitting. Three variables were created from the

IPAQ data and are reported fully below: (1) TMODEqv (leisure-time activity), (2) TPAmets (total physical activity) and (3) SDHav (sitting hours).

6.2.15.1 *Leisure time activity: TMODEqv*

TMODEqv or leisure-time activity is the total minutes per day of voluntary moderate equivalent physical activity. TMODEqv excludes the WORK and DOMESTIC domains. The rationale here is that only the physical activity domains that are essentially voluntary and amenable to a motivational intervention are included in this variable. TMODEqv includes walking, moderate and vigorous activity in the leisure and active transport domains and is standardised to moderate intensity equivalent (i.e. @ 4 METs intensity). **Figure 28** and **Table 18** illustrate the participants' levels of moderate intensity equivalent leisure time activity across the four time points.

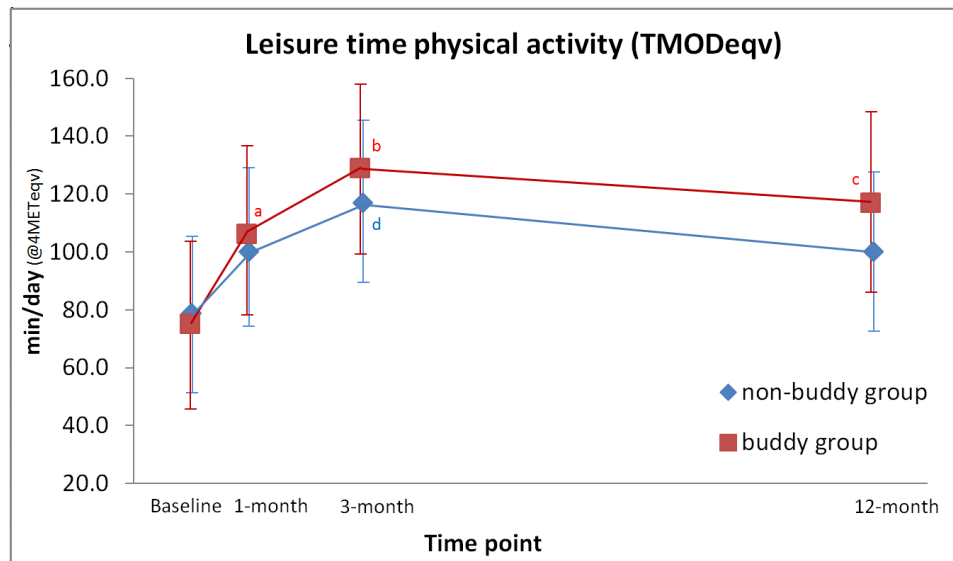


Figure 28: Estimated average minutes of leisure time physical activity per day and 95% confidence intervals (TMODEqv)

Estimated average minutes of voluntary moderate intensity (equivalent) physical activity and 95% Confidence Intervals (CI) for the outcome variable TMODEqv. TMODEqv includes leisure walking, moderate and vigorous leisure activity/exercise and active transport, all scaled to moderate intensity equivalent (i.e. @ 4 MET intensity). TMODEqv was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average leisure time activity level (TMODEqv) was not statistically different *between* the groups at any of the four time-points.

a: the exp. group estimate for TMODEqv at one-month was statistically different from baseline ($p=0.007$)

b: the exp. group estimate for TMODEqv at three-months was statistically different from baseline ($p=0.0001$)

c: the exp. group estimate for TMODEqv at 12-months was statistically different from baseline ($p=0.0007$)

d: the control group estimate for TMODEqv at three-months was statistically different from baseline ($p=0.0013$)

Table 18: Estimated average minutes of leisure time physical activity per day

Variable	Baseline	1-month	3-month	12-Month
TMODEqv	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	79	100	117	100
Buddy-group (TRI)	75	106	128	117

6.2.15.2 Effect size: TMODEqv

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for

TMODEqv was 78.75 min (SD 38.9) and at follow-up, 100 min (SD 65.6) ($t=1.819$) and the effect size, Cohen's $d = 0.50$. For the buddy group the baseline estimate for TMODEqv was 75.2 min (SD 44.2) and at follow-up, 117.1 min (SD 51) ($t=3.455$) and the effect size, Cohen's $d = 0.93$. The between-group effect size for the variable TMODEqv is $d = 0.42$ at 12-months; however this difference failed to reach the $p \leq 0.05$ statistical significance level (two-tail test)⁵⁰.

6.2.15.3 Summary: TMODEqv

Both groups progressively increased their leisure-time physical activity out to the 3-month follow-up. From 3-months to 12-months both groups' leisure-time physical activity began to decline but remained above baseline levels, in the case of the buddy-group, significantly so ($p= 0.0007$). However, between-group differences failed to reach statistical significance at any time point. For both groups, the increase was clinically significant and for the buddy-group at 3-months the increase represented an almost doubling of participants' leisure time activity on average. The participants with a physical limitation (PL=2) were found to exercise on average 62 min less per day than the participants without any physical limitation ($p=0.01$) however, on average, these participants did still make some increases. The season (summer/winter) appeared to make no difference to the amount of

⁵⁰ As a sensitivity analysis, one-tail tests were conducted for the between-group differences in TMODEqv at three and 12-months and these are suggestive of a trend towards significance ($p= 0.2$, $p= 0.14$ respectively).

leisure time activity undertaken and males were on average 28min/day more active than females ($p=0.03$).

6.2.15.4 Total physical activity: TPAmet

The outcome 'TPAmet' is a measure of total physical activity per day across all domains and all intensities. This is a standard measure of physical activity comparable across studies using the IPAQ (reported in Met-min/day). **Figure 29** and **Table 19** illustrate the participants' total physical activity per day across the four time points.

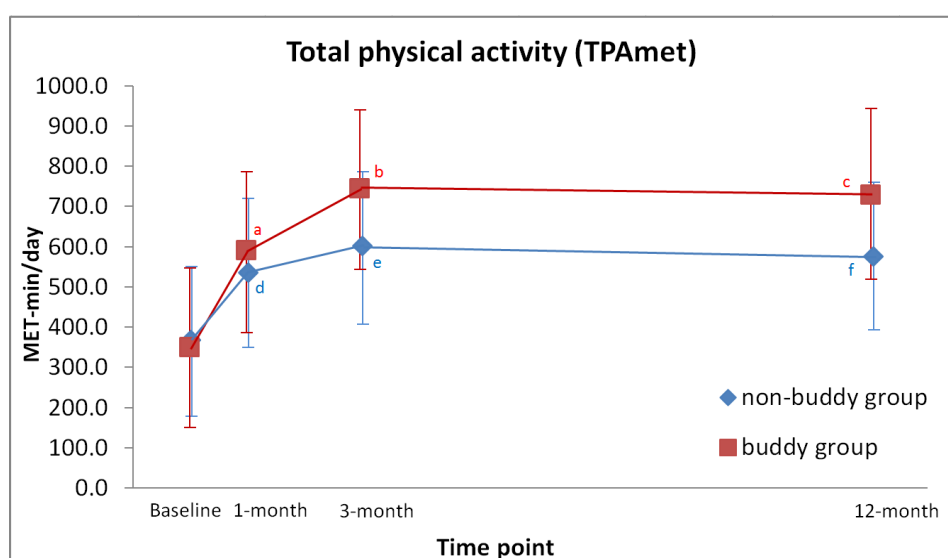


Figure 29: Estimated average total physical activity per day measured as MET-min/day and 95% confidence intervals (TPAmet)

Example, 729 MET-minutes of physical activity per day at an average intensity of 4-Mets (moderate intensity) is the equivalent of approximately 3hrs of moderate activity across all domains of work, transport, garden and housework and leisure-time activity. TPAmet was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average total physical activity per day (TPAmet) was not statistically different *between* the groups at any of the four time-points.

a: the exp. group estimate for TPAmet at one-month was statistically different from baseline ($p=0.0036$)

b: the exp. group estimate for TPAmet at three-months was statistically different from baseline ($p=0.0001$)

c: the exp. group estimate for TPAmet at 12-months was statistically different from baseline ($p=0.0001$)

d: the control group estimate for TPAmet at one-months was statistically different from baseline ($p=0.03$)

e: the control group estimate for TPAmet at three-months was statistically different from baseline ($p=0.003$)

f: the control group estimate for TPAmet at 12-months was statistically different from baseline ($p=0.008$)

Table 19: Estimated average total physical activity per day (Met-min/day)

Variable	Baseline	1-month	3-month	12-Month
TPAmet	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	368	535	602	576
Buddy-group (TRT)	250	590	746	730

6.2.15.5 Effect size: TPAmet

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for mean TPAmet was 368 units (SD 163)⁵¹ and at follow-up, 576 units (SD 505)⁵² ($t=2.680$) and the effect size, Cohen's $d = 0.73$. For the buddy group the baseline estimate for mean TPAmet was 350 units (SD 188)⁵³ and at follow-up, 729 units (SD 405)⁵⁴ ($t=4.781$) and the effect size, Cohen's $d = 1.29$. The between-group effect size for the variable TPAmet is $d = 0.86$ at 12-months; however this difference failed to reach the $p \leq 0.05$ statistical significance level⁵⁵.

⁵¹ 368 MET-minutes of physical activity per day at an average intensity of 4-Mets (moderate intensity) is the equivalent of approximately 1.5hrs (SD 40min) of moderate intensity physical activity.

⁵² 576 MET-minutes of physical activity per day at an average intensity of 4-Mets (moderate intensity) is the equivalent of approximately 2.4hrs (SD 2.1hrs) of moderate intensity physical activity.

⁵³ 350 MET-minutes of physical activity per day at an average intensity of 4-Mets (moderate intensity) is the equivalent of approximately 1.4hrs (SD 47min) of moderate intensity physical activity.

⁵⁴ 729 MET-minutes of physical activity per day at an average intensity of 4-Mets (moderate intensity) is the equivalent of approximately 3hrs (SD 1.7hrs) of moderate intensity physical activity.

⁵⁵ As a sensitivity analysis, one-tail tests were conducted for the between-group differences in TPAmet at three and 12-months and these are suggestive of a trend towards significance ($p= 0.09$, $p= 0.08$ respectively).

6.2.15.6 Summary: *TPAmet*

Both groups progressively increased their total physical activity per day (measured as MET-min/day) out to the 3-month follow-up. From 3-months to 12-months both groups' total physical activity began to decline slightly but remained well above baseline levels, for both groups, significantly so at 3-months and 12-months (exp. $p=0.0001$; control $p=0.008$) (between-group difference n/s). For example, an average buddy-group participant reported 729 MET-minutes of physical activity per day at 12-month follow-up or the equivalent of approximately 3hrs of moderate activity across all domains of work, transport, garden and housework and leisure-time activity. For both groups, the increase was clinically significant and for the buddy-group at 3-months the increase represented an almost doubling of participants' total physical activity on average ($p=0.0001$). The presence of a physical limitation or injury did attenuate the total physical activity undertaken by some participants (-451 Met/min/day, $p=0.006$)⁵⁶, much more so than it influenced leisure-time activity. However participants with physical limitations or injury did on average still make some increases to their leisure time physical activity. Again, the season (summer/winter) appeared to make no real difference to the amount of leisure time activity undertaken. Males were on average 164 Met-min/day more⁵⁷ active than females ($p=0.01$).

⁵⁶ -451 MET-minutes of physical activity per day at an average intensity of 4-Mets (moderate intensity) is the equivalent of approximately 1.8hrs (less) moderate intensity physical activity per day.

⁵⁷ 164 MET-minutes is the equivalent of approximately 40min of moderate intensity exercise per day.

6.2.15.7 Sitting per day: SDHav

Sitting hours per day as a measure of inactivity are shown in **Figure 30** and **Table 20**.

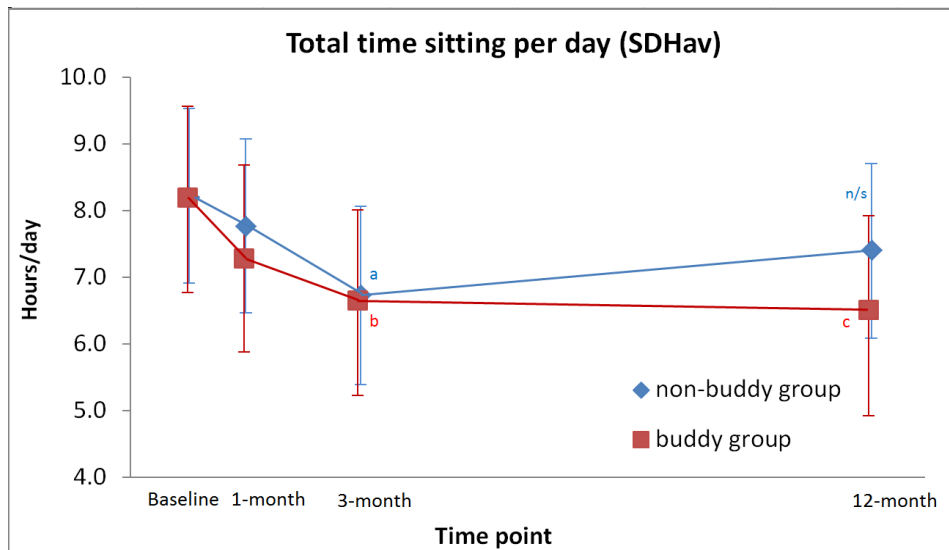


Figure 30: Estimated average total time spent sitting inactive per day and 95% confidence intervals (SDHav)

SDHav was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average sitting time per day (SDHav) was not statistically different *between* the groups at any of the four time-points.

a: the control group estimate for SDHav at three-months was statistically different from baseline ($p=0.03$)

b: the exp. group estimate for SDHav at three-months was statistically different from baseline ($p=0.016$)

c: the exp. group estimate for SDHav at 12-months was statistically different from baseline ($p=0.01$)

Table 20: Estimated average total time spent sitting inactive per day

Variable	Baseline	1-month	3-month	12-Month
SDHav	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	8.20	7.77	6.73	7.41
Buddy-group (TRT)	8.18	7.28	6.64	6.50

6.2.15.8 *Effect size: SDHav*

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for SDHav was 8.2hrs (SD 2.87) and at follow-up, 7.41hrs (SD 3.11) ($t=-1.207$) and the effect size, Cohen's $d = -0.31$. For the buddy group the baseline estimate for SDHav was 8.18 hrs (SD 2.71) and at follow-up, 6.5 hrs (SD 2.90) ($t=-2.485$) and the effect size, Cohen's $d = -0.68$. The between-group effect size for the variable SDHav is $d = 0.32$ at 12-months; however this difference failed to reach the $p \leq 0.05$ statistical significance level⁵⁸.

6.2.15.9 *Summary: SDHav*

Both groups progressively reduced the time spent sitting per day on average out to the 3-month follow-up. From 3-months to 12-months the buddy-group continued to reduce the average time spent sitting while the non-buddy group reversed the trend. In the case of the buddy-group, the reductions in sitting time were statistically significant at 3-months ($p=0.016$) and 12-months ($p=0.11$). On average, buddy-group participants reduced their sitting time by 1.6 hours vs. non-buddy group participants 0.8 hours; however this between-group difference failed to reach statistical significance at any time point. The presence of a physical limitation or injury did influence sitting time adding nearly two hours per day on

⁵⁸ As a sensitivity analysis, a one-tail test was conducted for the between-group differences in SDHav at 12-months and this is suggestive of a trend towards significance ($p= 0.17$).

average ($p=0.01$). The season (summer/winter) appeared to make a small difference (+30min in winter) to the amount of time people spent sitting on average ($p=0.05$). Males tended to sit less than females by approximately one hour per day ($p=0.05$).

6.2.16 Body Mass Index: BMI

Body Mass Index (BMI) was calculated from participants weight (**Table 21**) using the formula $BMI = \text{body mass (in Kilograms)} / \text{height}^2$ (in meters) (**Figure 31** and **Table 22**). With respect to baseline BMI, over half (58%) of the participants were in the normal range (18.5-24.9 kg/m²) with the remaining participants being either overweight (18) or obese/morbidly obese (23%).

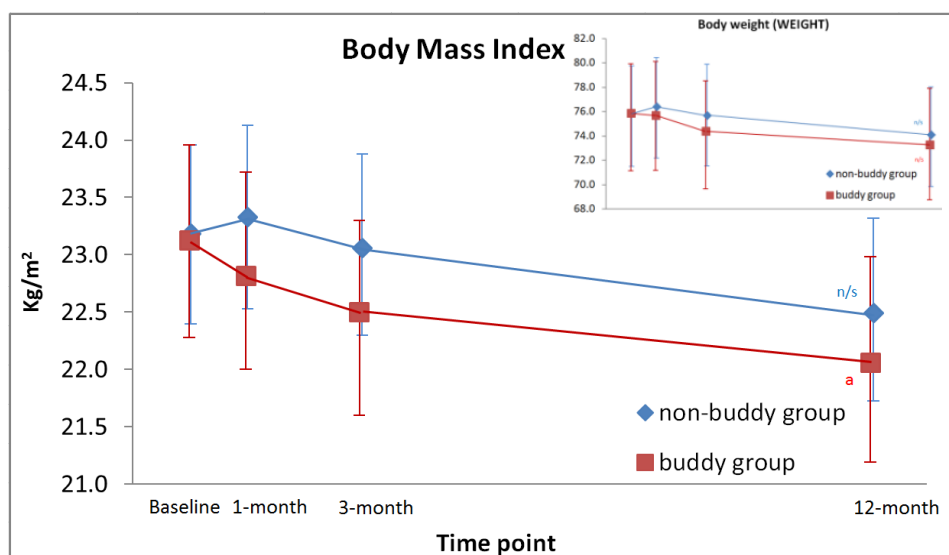


Figure 31: Estimated average body mass index and 95% confidence intervals (BMI)

BMI was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. Insert: body weight showing a similar pattern (BMI being a function of weight). The estimated average BMI was not statistically different *between* the groups at any of the four time-points.

a: the exp. group estimate for BMI at 12-months was statistically different from baseline ($p=0.006$)

Table 21: Estimated average body mass (Kg)

Variable	Baseline	1-month	3-month	12-Month
Weight	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	75.9	76.4	75.7	74.1
Buddy-group (TRT)	75.89	75.72	74.41	73.31

Table 22: Estimated average body mass index (BMI)

Variable	Baseline	1-month	3-month	12-Month
BMI	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	23.18	23.33	23.06	22.79
Buddy-group (TRT)	23.81	22.8	22.49	22.06

6.2.16.1 Effect size: BMI

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for BMI was 25.02 (SD 5.29) and at follow-up, 22.5 (SD 4.46) ($t=-1.91$) and the effect size, Cohen's $d = -0.52$. For the buddy group the baseline estimate for BMI was 23.1 (SD 5.97) and at follow-up, 22.1 (SD 4.32) ($t=-2.84$) and the effect size, Cohen's $d = -0.77$. The between-group effect size for the variable BMI is $d = 0.07$ at 12-months and this difference failed to reach the $p \leq 0.05$ statistical significance level.

6.2.16.2 Summary: BMI

In both groups, BMI progressively reduced on average out to the 12-month follow-up. While the average reduction in BMI is clinically significant, the reductions in each group were not statistically significant. BMI is a function of a person's weight and their height ($BMI = \text{weight}/h^2$) and there was considerable variation between participants' weight with the lightest person weighing 52.5 kg and the heaviest 127kg (mean 76.39kg, SD 16.4kg, $n=59$). Thus, the heaviest participant was 2.5 times the weight of

the lightest person and this range is reflected in the fairly wide 95% CIs. Neither age nor gender appeared to be related to BMI. Those participants with a physical limitation were on average 3.5kg/m² lower on the BMI scale than those without a physical limitation (p=0.0001)⁵⁹.

6.2.17 Health-related quality of life: PCS & MCS

The SF36v2 is a generic measure of health-related quality of life, providing scores on eight areas of functioning and well-being. Only the summary scores were analysed: firstly the physical component summary (PCS) (Figure 32 and Table 23) and then the mental component summary (MCS) (Figure 33 and Table 24). On the PCS and MCS scales, higher scores represent better self-perceived physical/mental health.

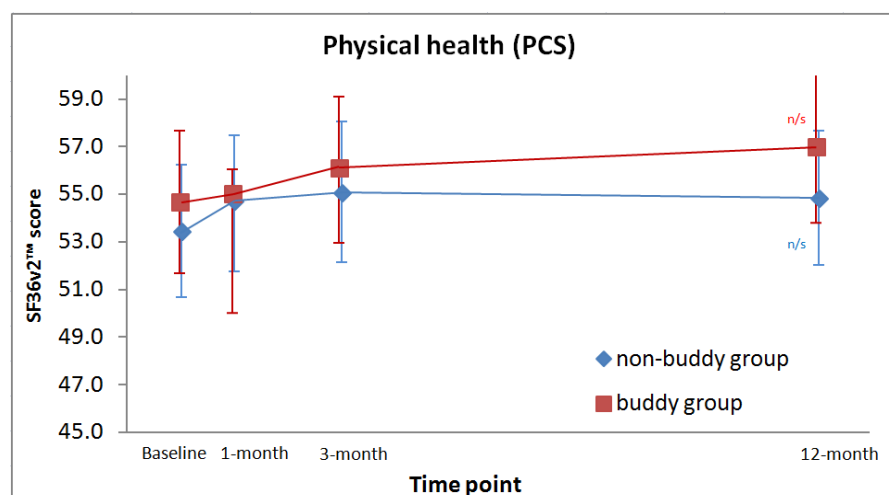


Figure 32: Estimated average physical health component score and 95% confidence intervals (PCS)

PCS was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average PCS was not statistically different from baseline at any of the four time-points.

⁵⁹ Three participants had a pre-existing injury from being active and two participants were actively trying to 'get in shape' and increase fitness pre-pregnancy.

Table 23: Estimated average physical health component score

Variable	Baseline	1-month	3-month	12-Month
PCS	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	53.47	54.74	55.08	54.83
Buddy-group (TRT)	54.69	55.02	56.11	57.00

6.2.17.1 *Effect size: PCS*

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for PCS was 53.5 units (SD 7.14) and at follow-up, 54.8 units (SD 9.33) ($t=1.10$) and the effect size, Cohen's $d = 0.27$. For the buddy group the baseline estimate for PCS was 54.7 units (SD 7.17) and at follow-up, 57 units (SD 8.87) ($t=1.655$) and the effect size, Cohen's $d = 0.45$. The between-group effect size for the variable PCS is $d = 0.28$ at 12-months; however this difference failed to reach the $p \leq 0.05$ statistical significance level.

6.2.17.2 *Summary: PCS*

On the PCS scale, higher scores represent better self-perceived physical health. In both groups, PCS increased slightly on average out to the 12-month follow-up. However, the increase in mean PCS in each group was not statistically significant. Those participants with a physical limitation had PCS scores on average 7.7 points lower than those who did not, and this was statistically significant ($p=0.008$). Women scored slightly lower than men by 1.3 points, but this was not statistically significant.

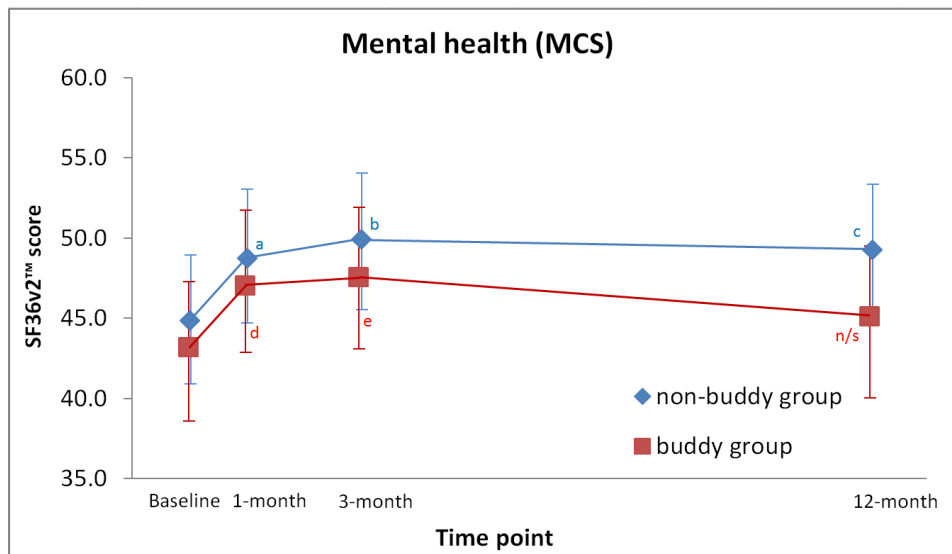


Figure 33: Estimated average mental health component score and 95% Confidence Intervals (MCS)

MCS was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average MCS was not statistically different *between* the groups at any of the four time-points.

a: the control group estimate for MCS at one-month was statistically different from baseline ($p=0.05$)

b: the control group estimate for MCS at three-months was statistically different from baseline ($p=0.017$)

c: the control group estimate for MCS at 12-months was statistically different from baseline ($p=0.03$)

d: the exp. group estimate for MCS at one-months was statistically different from baseline ($p=0.05$)

e: the exp. group estimate for MCS at three-months was statistically different from baseline ($p=0.03$)

Table 24: Estimated average mental health component score

Variable	Baseline	1-month	3-month	12-Month
MCS	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	44.84	48.72	49.92	49.27
Buddy-group (TRT)	43.21	47.05	47.55	45.13

6.2.17.3 Effect size: MCS

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for MCS was 44.8 units (SD 9.85) and at follow-up, 49.27 units (SD 8.72) ($t=2.3$)

and the effect size, Cohen's $d = 0.61$. For the buddy group the baseline estimate for MCS was 43.2 units (SD 10.93) and at follow-up, 45.13 units (SD 6.89) ($t=0.969$) and the effect size, Cohen's $d = 0.26$. The between-group effect size for the variable MCS is $d = -0.39$ (i.e. the advantage to the control group) at 12-months; however this difference failed to reach the $p \leq 0.05$ statistical significance level.

6.2.17.4 *Summary: MCS*

On the MCS scale, higher scores represent better self-perceived mental health. In both groups, average MCS increased significantly out to the 3-month follow-up (exp. $p=0.26$; control $p=0.017$) and at 12-months the non-buddy group remained so ($p=0.03$) however the buddy group was no longer significant. The between-group differences were not statistically significant. Beyond three-month follow-up, MCS declined but still remained above baseline out to 12months.

6.2.18 *Generalised self-efficacy: SelfE*

The General Self-Efficacy Scale is a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. **Figure 34** and **Table 25** show the groups' estimated average self-efficacy scores. The possible range of scores is from 10 to 40 points and in many samples the mean had been around 29 (SD=5) (e.g. US-American adult population, $n = 1,594$ mean 29.48, SD 5.13) (Scholz, Gutiérrez-Doña, Sud, & Schwarzer, 2002).

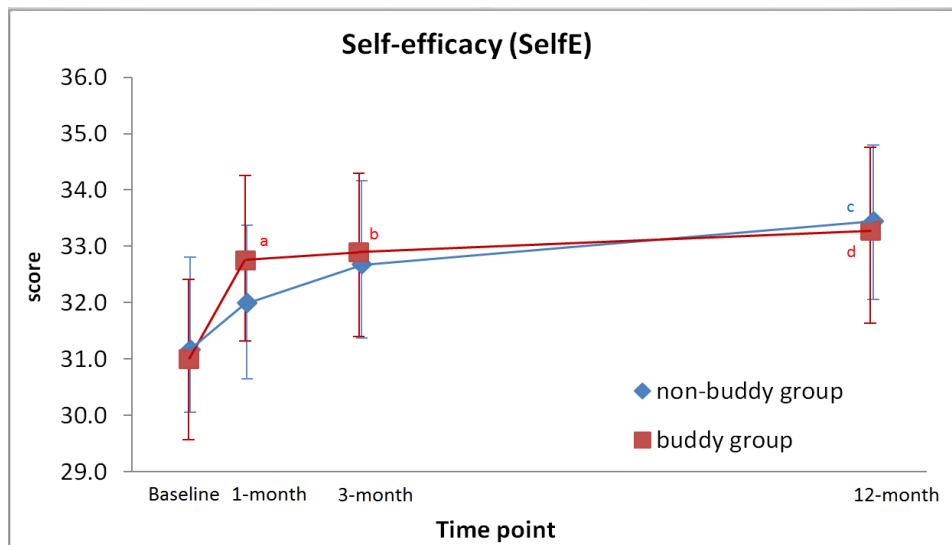


Figure 34: Estimated average self-efficacy score and 95% confidence intervals (SelfE)

SelfE was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average SelfE was not statistically different *between* the groups at any of the four time-points.

a: the exp. group estimate for SelfE at one-month was statistically different from baseline ($p=0.006$)

b: the exp. group estimate for SelfE at three-months was statistically different from baseline ($p=0.002$)

c: the control group estimate for SelfE at 12-months was statistically different from baseline ($p=0.003$)

d: the exp. group estimate for SelfE at 12-months was statistically different from baseline ($p=0.016$)

Table 25: Estimated average self-efficacy score

Variable	Baseline	1-month	3-month	12-Month
SelfE	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	31.17	32.00	32.69	33.45
Buddy-group (TRT)	30.10	32.75	32.89	33.27

6.2.18.1 Effect size: Self-efficacy

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for SelfE was 30.99 units (SD 3.90) and at follow-up, 33.27 units (SD 3.94) ($t=3.160$) and the effect size, Cohen's $d = 0.83$. For the buddy group the baseline estimate for SelfE was 31.16 units (SD 4.66) and at follow-up,

33.45 units (SD 2.52) ($t=3.478$) and the effect size, Cohen's $d = 0.94$. The between-group effect size for the variable SelfE is $d = 0.04$ at 12-months; and this difference failed to reach the $p \leq 0.05$ statistical significance level.

6.2.18.2 *Summary: Self-efficacy*

On the Generalised Self-efficacy scale, higher scores represent better self-efficacy. In both groups, average self-efficacy increased out to the 12-month follow-up. At 12-months, both groups' self-efficacy remained above baseline levels and for both groups this was statistically significant (exp. 0.0016; control $p=0.0028$), however this between group difference was non-significant. Females tended to have slightly less confidence (self-efficacy) overall ($p<0.05$).

6.2.19 *Exercise self-efficacy: ExSelfE*

The Physical Exercise Self-Efficacy scale is a 5-item psychometric scale that is designed to assess optimistic self-beliefs to cope with commonly perceived barriers to physical activity. **Figure 35** and **Table 26** show the groups' estimated average exercise self-efficacy scores. The response range at each item was 1 to 4; correspondingly, the theoretical range of sum scores was from 5 to 20. The frequency distribution of the physical exercise self-efficacy sum scores has been demonstrated to be close to a normal distribution (Mean = 11.836, SD = 3.779, $n = 1,745$) (Schwarzer & Renner, 2000).

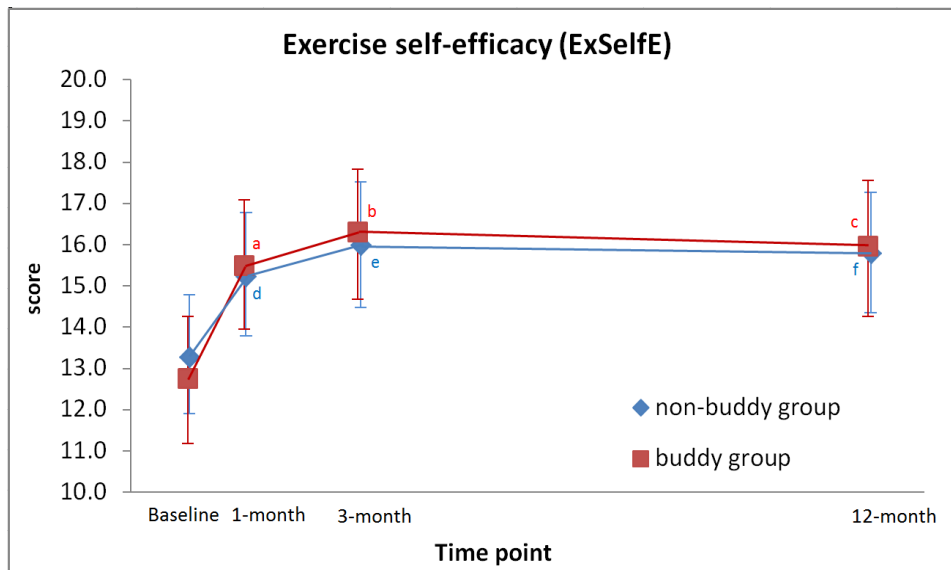


Figure 35: Estimated average exercise self-efficacy and 95% confidence intervals (ExSelfE)

ExSelfE was adjusted for age, gender, season, BMI at baseline, hours of sitting per day at baseline, generalised self-efficacy at baseline, exercise specific self-efficacy at baseline, social support, and the presence of physical limitations and/or injury. The estimated average ExSelfE was not statistically different *between* the groups at any of the four time-points.

a: the exp. group estimate for ExSelfE at one-month was statistically different from baseline ($p=0.001$)

b: the exp. group estimate for ExSelfE at three-months was statistically different from baseline ($p=0.001$)

c: the exp. group estimate for ExSelfE at 12-months was statistically different from baseline ($p=0.001$)

d: the control group estimate for ExSelfE at one-month was statistically different from baseline ($p=0.0008$)

e: the control group estimate for ExSelfE at three-months was statistically different from baseline ($p=0.0002$)

f: the control group estimate for EXSelfE at 12-months was statistically different from baseline ($p=0.0004$)

Table 26: Estimated average exercise self-efficacy

Variable	Baseline	1-month	3-month	12-Month
ExSelfE	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	13.27	15.29	15.99	17.79
Buddy-group (TRT)	12.74	15.48	16.30	15.95

6.2.19.1 Effect size: Exercise self-efficacy

The effect size is a standardised, scale-free measure of the relative size of the effect of the intervention in each group, comparing baseline to 12-month follow-up. For the non-buddy group the baseline estimate for ExSelfE was 13.27 units (SD 2.91) and at follow-up, 15.78 units (SD 3.88)

($t=3.664$) and the effect size, Cohen's $d = 0.96$. For the buddy group the baseline estimate for ExSelfE was 12.74 units (SD 2.97) and at follow-up, 15.95 units (SD 2.52) ($t=4.484$) and the effect size, Cohen's $d = 1.21$. The between-group effect size for the variable ExSelfE is $d = 0.05$ at 12-months; and this difference failed to reach the $p \leq 0.05$ statistical significance level.

6.2.19.2 *Summary: Exercise self-efficacy*

On the Exercise Self-efficacy scale, higher scores represent better self-efficacy. In both groups, average self-efficacy increased significantly to 3-months before falling slightly out to the 12-month follow-up. At 12-months, both groups' self-efficacy remained above baseline levels and for both groups this was statistically significant (exp. $p=0.001$; control $p=0.0004$) however the between group difference was non-significant. Females tended to have slightly less confidence than male participants to continue to exercise in the face of perceived barriers ($p<0.05$).

6.2.20 *Effect size summary*

Table 27 summarises the pattern of within-group and between group effect sizes across the main outcome variables, reflecting the size of the apparent relationships, as compared at baseline and the 12-month follow-up (rather than assigning a significance level or indicating whether the relationship could be due to chance). Note that Cohen's conventional criteria small (0.2), medium (0.5), or large (0.8 +) have been added to **Table 27** using the

superscript notation ^S, ^M and ^L (see the guide to interpretation **Table 28**) and that these are relative, not only to each other, but also to this area of behavioural science and to the research method being employed (see also **Discussion**). The effect sizes have been calculated for the change in means between baseline and the 12-month time-points only. In some cases, comparisons with one-month or three-month data would result in effects sizes that are larger than those reported below, but only the overall effects have been reported as a fair representation of the *real-world* effect of the interventions.

Table 27: Summary of within and between group effect sizes

Variable	Description	Effect size Cohen's d		
		Control	Exp	Between
FITNESS	Cardiovascular fitness	1.54 ^L	1.55 ^L	0.00 ^S
TMODEqv	Leisure walking, moderate & vigorous & transport	0.50 ^M	0.93 ^L	0.42 ^S
TPAmet	Total physical activity per day	0.73 ^M	1.29 ^L	0.86 ^L
SDHav	Time spent sitting inactive per day	0.31 ^S	0.68 ^M	0.32 ^S
BMI	BMI	0.52 ^M	0.77 ^M	0.07 ^S
PCS	Physical health component score	0.27 ^S	0.45 ^S	0.28 ^S
MCS	Mental health component score	0.61 ^M	0.26 ^S	-0.39 ^S
SelfE	Generalised self-efficacy	0.83 ^L	0.94 ^L	0.04 ^S
ExSelfE	Exercise self-efficacy	0.96 ^L	1.21 ^L	0.05 ^S

Table 28: A guide to interpreting Cohen's *d*

Cohen's Standard	Effect Size	Percentile Standing	Percent Non-overlap of	
	2.0	97.7	81.1%	Effect sizes can also be thought of as the average percentile standing of the average treated (or experimental) participant relative to the average untreated (or control) participant. An ES of 0.0 indicates that the mean of the treated group is at the 50th percentile of the untreated group. An ES of 0.8 indicates that the mean of the treated group is at the 79th percentile of the untreated group.
	1.9	97.1	79.4%	
	1.8	96.4	77.4%	
	1.7	95.5	75.4%	
	1.6	94.5	73.1%	
	1.5	93.3	70.7%	
	1.4	91.9	68.1%	
	1.3	90	65.3%	
	1.2	88	62.2%	
	1.1	86	58.9%	
	1.0	84	55.4%	Effect sizes can also be interpreted in terms of the percent of non-overlap of the treated group's scores with those of the untreated group. An ES of 0.8 indicates a non-overlap of 47.4% in the two distributions OR the percentage of control group participants who would have a score below the average subject in the experimental group = %47.4
	0.9	82	51.6%	
LARGE	0.8	79	47.4%	
	0.7	76	43.0%	
	0.6	73	38.2%	
MEDIUM	0.5	69	33.0%	
	0.4	66	27.4%	
	0.3	62	21.3%	
SMALL	0.2	58	14.7%	
	0.1	54	7.7%	
	0.0	50	0%	

Source: Cohen (1988, pp. 21-23)

6.2.21 Exercise stage of change: TTM

The Transtheoretical Model (TTM) (Prochaska & DiClemente, 1982) emphasises the temporal dimension of change and the idea of *readiness*. **Figure 36** and **Figure 37** and **Table 16** below are different approaches to illustrating the participants' progression through the stages between baseline and the 12-month follow-up. As described by Rossi (2000), the simplest approach to conceptualizing stage progression is to count the number of stages progressed as the outcome (regression to an earlier stage is assigned a negative score). Overall, the average stage progression was similar in both groups; however a small between-group difference is apparent for participants who regressed (negative stage progression). In the non-buddy (control) group, six people regressed a total of seven stages as

compared to three people regressing a total of three stages in the buddy-group (the experimental group). Most commonly, participants advanced one stage over the 12-months of follow-up.

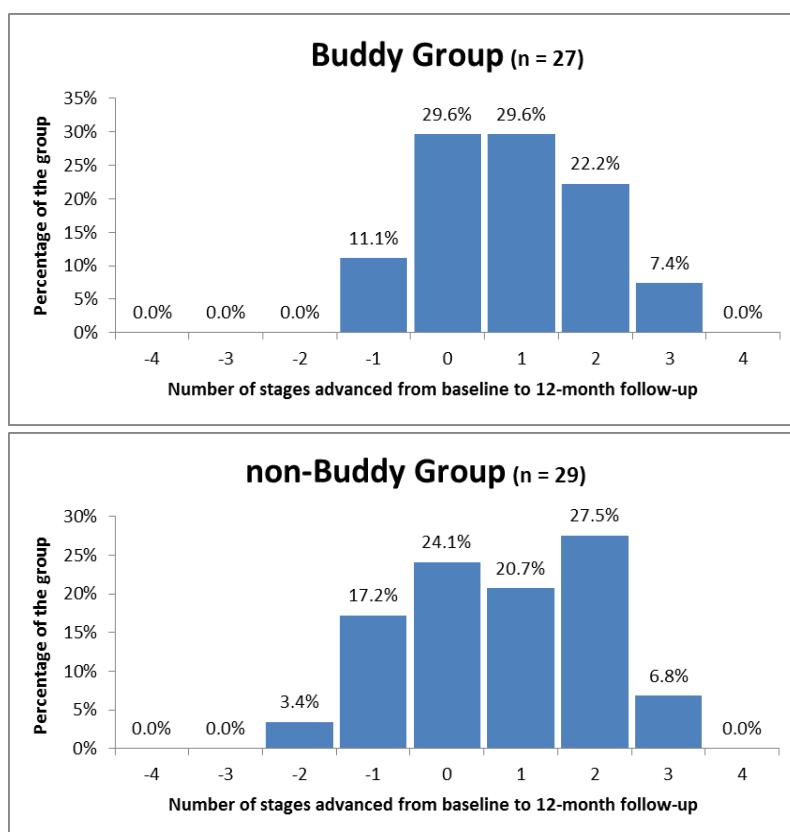


Figure 36: Participants' stage progression over 12-months

The statistical significance of such shifts in progression/regression has not been determined (see Discussion). The stacked histograms above (**Figure 36**) illustrate the amount that participants progressed through the Stages of Change between baseline and the 12-month follow-up (frequency counts of participants have been converted to percentages as the groups differ in the number of participants who reported this measure). **Table 29** shows the

actual number of participants in each stage at the four time-points, separately by group.

Table 29: The distribution of participants over the four time points

Time	Pre-contemplation	Contemplation	Preparation	Action	Maintenance	n
Buddy group						
Baseline	0	5	11	7	4	27
One month	0	3	6	13	4	26
Three months	0	1	5	15	7	28
One year	0	1	5	8	13	27
non-buddy group						
Baseline	1	3	16	4	5	29
One month	0	3	5	13	5	26
Three months	0	1	6	15	5	27
One year	0	6	1	8	14	29

Finally **Figure 37** below illustrates the participants’ pattern of progression through the Stages of Change between baseline and the 12-month follow-up (ordered: group by end-stage by baseline-stage).

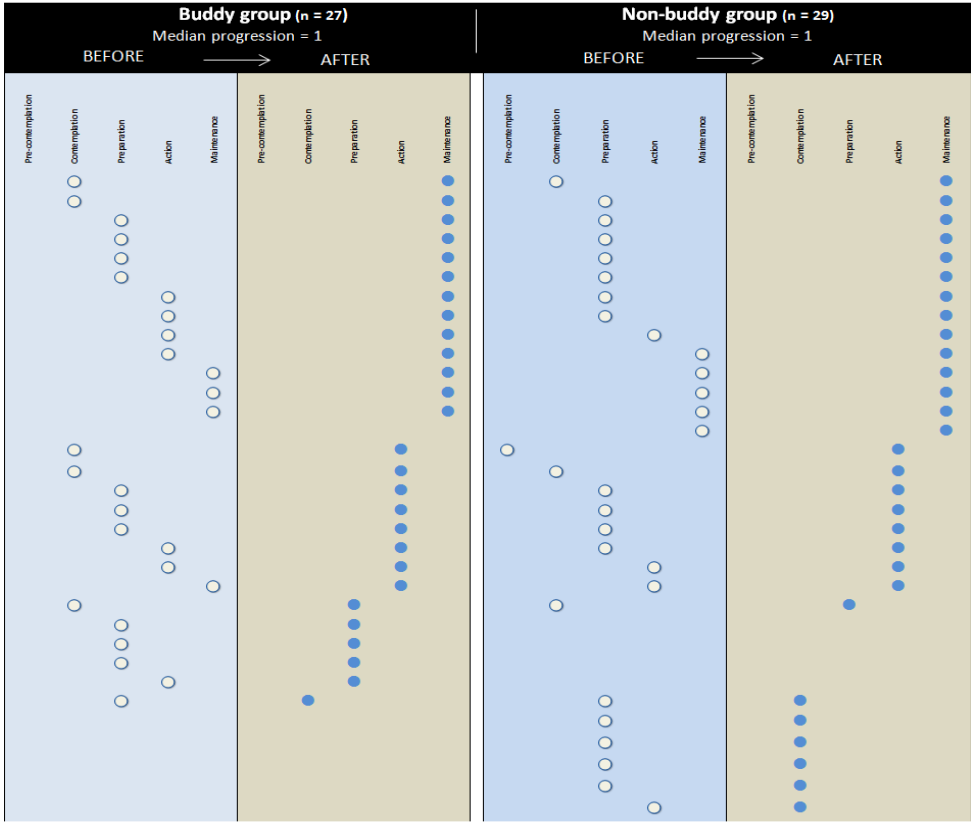


Figure 37: The individual participant’s (n = 56) progression of stages between baseline and 12-month follow-up– ordered by group by end-stage by baseline-stage

Figure 37 illustrates the participants’ progression through the Stages of Change between baseline and the 12-month follow-up (ordered: group by end-stage by baseline-stage). There was no difference between groups in the number of forward progression steps made. There was however a difference in the number of people regressing (negative stage-progression) during the 12-months of the study. In the non-buddy (control) group, six people regressed a total of seven stages as compared to three people regressing a total of three stages in the buddy-group (the experimental group). The statistical significance of the shift in means and/or the difference in regression has not been determined. Debate exists as to the relative weighting attributable to shifts into or out of the different stages (see Discussion). For example, the cognitive and behavioural strategies and motivation required to move from the pre-contemplation stage to the contemplation stage are likely to differ to those required to a move from action to maintenance (sustaining behaviour over time). It is not known if the shift from any one particular stage is equitable to a shift from any other particular stage and how individual’s different motivational profiles and goal orientations influence their experienced degree-of-difficulty in stage progression. Therefore, the data are presented here in a format that illustrates the progression within both groups over time. While it appears that assignment to the buddy-group may be associated with more resilient stage progression overall, this cannot be determined conclusively from the available data.

6.2.22 Treatment fidelity

Treatment fidelity was assessed by four measures (1) the number of sessions of MI (or the dose), the number of follow-up emails sent ('exchanges') and (3) by measuring therapist competency and treatment delivery using the MITI rating instrument and (4) via the qualitative data⁶⁰. In clinical trials, the MITI essentially answers the question "How much is this interaction like Motivational Interviewing?" The MITI was used in exactly the same way as described previously in the **Pilot Study** section (p. 172) and only the results are presented here. All three results (**Figures 38 & 39**) demonstrate equivalence and these variables made no difference to the estimates in the statistical models and were therefore dropped from the analysis.

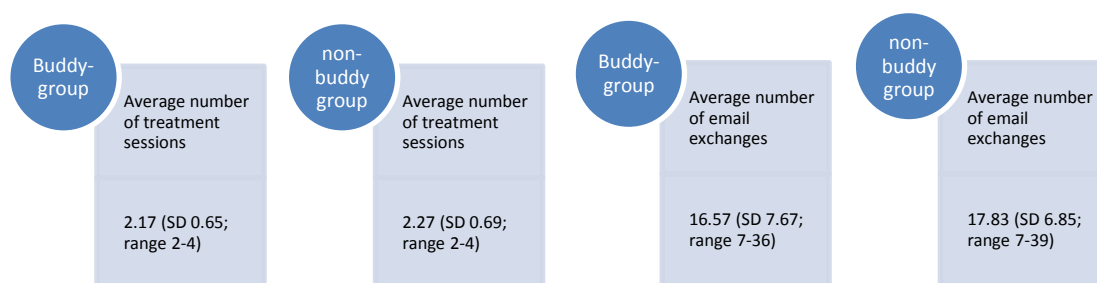


Figure 38: Average number of email exchanges and treatment sessions per group

⁶⁰ See the Discussion chapter for an account of the broader issues of study fidelity.

Figure 39 shows the average fidelity scores based on random sampling of four interviews taken from each group (T1= first quarter of the intervention period) and then from the last quarter of the intervention period (T2). These results can be seen to be consistent across groups and across time (also see the pilot study MITI scores, p.172).

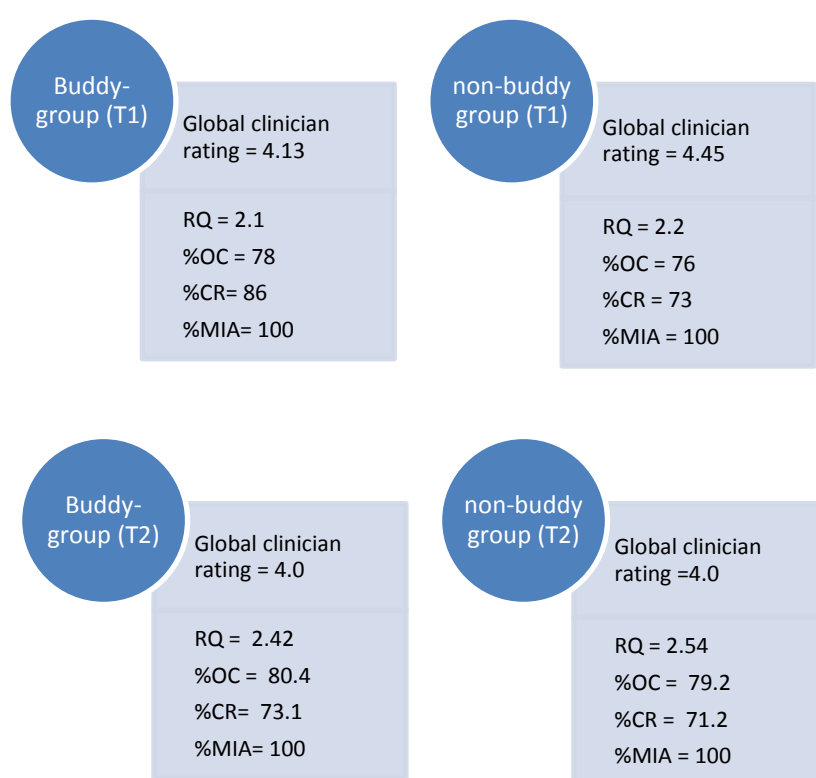


Figure 39: Treatment fidelity scores via the MITI 3.1.1

OQ = Open Question; CR = Complex Reflection; R:Q = Total Reflection to Question ratio; %CR = the percentage of complex reflections out of the total number of reflections; %OC = the percentage of open questions out of the total number of all questions.

6.2.23 *Helpful responses questionnaire*

The Helpful Responses Questionnaire (HRQ) is designed to measure reflective listening and empathic ability, skills which are central to the

implementation of motivational interviewing. The instrument includes six scenarios that are representative of mental health, addiction, and social service settings. a particular HRQ score or change in score does not guarantee generalisability to any specific practical context nor maintenance of a certain level of empathy over time (Miller, 1991). **Figure 40** presents the HRQ scores by gender. Female buddies (n=11) scored on average 2.8 points (SD 2.1; min 0- max 6) and Male buddies (n=13) 1.5 points (SD 1.6; min 0-max 6). For all the buddies who returned the HRQ questionnaire (n=24), the mean HRQ score was 2.1 (SD 1.9; min 0-max 6).

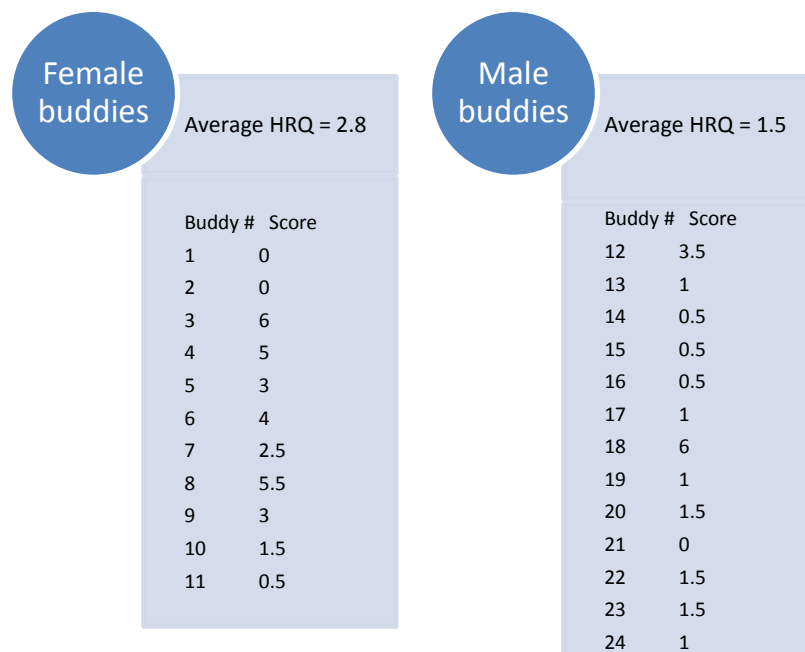


Figure 40: Averaged HRQ scores by gender

The Helpful Responses Questionnaire was normed on a group of 190 paraprofessional counsellors (Miller, 1991). Responses are scored on a 0-5 point scale and the six responses are averaged for the final HRQ score. Miller (1991) reported a group mean score of 1.5 for untrained paraprofessional counsellors and 3.1 for the same counsellors after a training workshop.

6.3 *Qualitative results: exit survey*

6.3.1 *Exit survey free-text and multi-choice responses*

Open response questions were included in the exit-survey administered to all participants at the 12-month follow-up assessment (along with other multi-choice items as presented below). The questions were designed to elicit participants' subjective experience of the intervention programme and these written responses were analysed using thematic analysis.

The summary tables below provide exemplars of key points that were reported in the questionnaire responses. The subsequent integrative synthesis focused on summarising the data, rather than focusing on the development of higher order concepts or theories. This cursory analysis does not attempt to reflect the frequency with which particular themes were reported nor does it attempt to indicate the *weighting* or level of explanatory value. The analysis does however serve as a basic strategy for enhancing the presentation of these findings, to translate them into the language of intervention and implementation. This highlighting of the *potential* significance and *actionability* of the findings is with the view to future programme refinement (Sandelowski & Leeman, 2012).

Four main themes have been identified from a total of 81 long answer responses from the experiment group participants only. Participants made responses ranging from five words to 255 words per question. The first two themes have been judged to be *outcome themes* and *the remaining* two as

process themes. These four themes along with five examples each are presented below, namely: *ripple-effect*, *accountability*, *programme acceptability* and *buddy matching*. In addition **Figure 41- Figure 43** provide information on buddy characteristics, helping strategies and time engaged in the buddy relationship.

Table 30 summarises the outcome theme ripple-effect. The term ripple-effect, as used in this specific context, is a component of social engagement that can promote health behaviour change not only in an individual, but at the interface of the individual↔social group. The intervention was specifically aimed at strengthening social cohesion, and propagating an intervention *ripple-effect* that spreads through both new and existing channels. The summary below evidences the ripple-effect acting within the group studied.

Table 30: Sentence synthesis to structure the study findings for the theme 'ripple effect'

Participant	The buddy intervention appeared to exert an influence in the life of the support person (buddy) also and this reciprocal determinism helped both people to achieve certain shared goals.
Person 1	We've started to make running something we can do at least once a week to spend quality time together in our busy schedule too.
Person 2	I have relied heavily on my buddy and as a result we have both made lifestyle changes that has seen him take up running and myself complete two half marathons in six months.
Person 3	This programme also gave my buddy who is also my partner great foundations to build our healthy lifestyle together.
Person 4	We think of ourselves as a little "family" unit, and it has been really exciting to be able to support each other to start exercising
Person 5	Went on bike rides with others to motivate me

Table 31 below summarises the outcome theme accountability. Accountability, as used here, is a component of social engagement that has

been used to describe any implied or explicit understanding between two people, or any rules and expectations that orient the agent's behaviour (the participant) to the role enacted by the overseer (the buddy) (Sharpe, 2000). According to this understanding of accountability, if a participant and a buddy establish a relationship based on trust and expected conduct, then a link will be formed between accountability and individual conscience (Sharpe, 2000). The summary **Table 31** evidences the adoption of accountability as a motivational tool.

Table 31: Sentence synthesis to structure the study findings for the theme 'accountability'

Participant	The buddy intervention appeared to induce an expectation of accountability between the participant and the support person (buddy) and this sense of accountability helped the participant to stay engaged to achieve certain goals.
Person 1	... later, after 2 months no contact, I was starting to get lax so linked back in with my buddy for me to be accountable to her again.
Person 2	It is good to have a support exercise buddy to keep accountable to
Person 3	Telling others of my intentions increases the likelihood of me carrying them out as it attaches accountability
Person 4	That I will exercise if otherwise I would let down a friend or colleague
Person 5	Having a buddy helps because you have someone to answer to

Table 32 (below) summarises the process theme of *acceptability*. The participant responses reflect the general levels of satisfaction with the programme as reported by experimental group participants. The summary below provides evidence that the experimental group participants were generally satisfied with the programme and in some examples, specifically the buddy-MI component.

Table 32: Sentence synthesis to structure the study findings for the theme 'general programme acceptability'

Participant	The buddy intervention appeared to be acceptable and valued by the participants and it helped the participant and the support person to understand the challenges around staying active.
Person 1	The active lifestyle I was inspired to adopt as a result in participating in this experiment has basically 'cured' a depressive illness I have been battling with for nearly a decade, where medication has failed, so I am very happy and grateful
Person 2	So happy that I have used exercise and my motivational buddy to get through an extremely difficult year of work and stress.
Person 3	Overall, It was so good to have our sessions together with my partner there as a buddy, because he got to see how important exercise is for me, and from that he was very motivating for me.
Person 4	I particularly enjoyed the sessions with the therapist - very motivational
Person 5	This programme was really beneficial for me

Table 33 summarises the process theme of *buddy-matching*. The participant responses reflected that not all of the buddy partnerships were perceived by the participants as satisfactory and a selective example of these are presented. The summary below provides evidence that, for some experimental group participants, the buddy-system may have been ineffective or even harmful to their motivation and efforts in becoming more physically active.

Table 33: Sentence synthesis to structure the study findings for the theme 'buddy matching'

Participant	The buddy intervention was not effective for participants when the buddy match or relationship quality or style was poor and it resulted in participant dissatisfaction with the support person and possibly an impediment to staying active.
Person 1	I could have chosen someone who would have been more encouraging and supportive
Person 2	My buddy didn't keep up her role and I didn't keep her at it
Person 3	I noticed that when my buddy stopped chasing me up I became more slack about exercising
Person 4	Later I forgot about the program and I guess so did my buddy
Person 5	A buddy is probably useful (mine didn't work out at all!)

6.3.2 Multi-choice responses

Experimental group participants were also asked to select any number of items from a drop-down menu that described the nature of the support

provided by their motivational-buddy (What types of things did their motivational-buddy do?). **Figure 41** is a sorted histogram of all the participant responses.

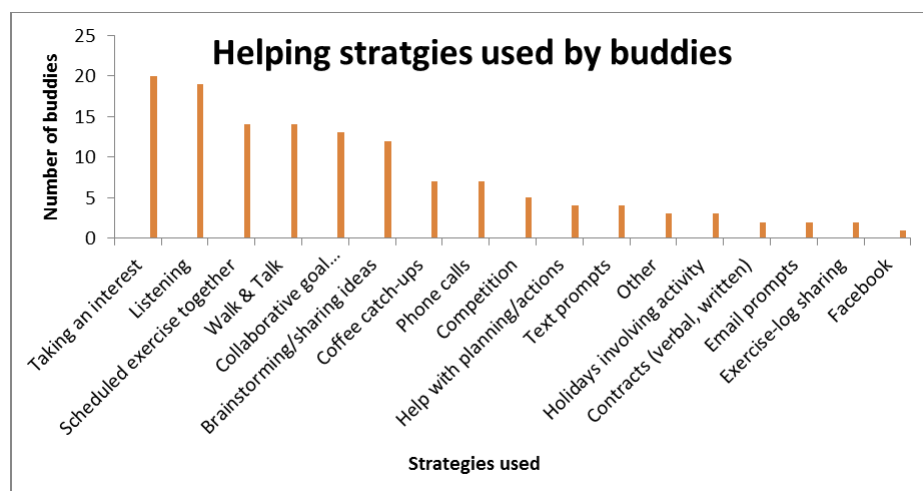


Figure 41: Histogram of all the participant responses describing their buddy's motivational strategies

Other= Caring in a collaborative manner without judgement; personal training; Conscience on my shoulder

Experimental group participants were also asked to select any number of items from a drop-down menu that described the *style* of the support and motivation provided by their motivational-buddy and their characteristics (completing the statement: *On the whole, my motivational-buddy was...*).

Figure 42 is a sorted histogram of all the participant responses.

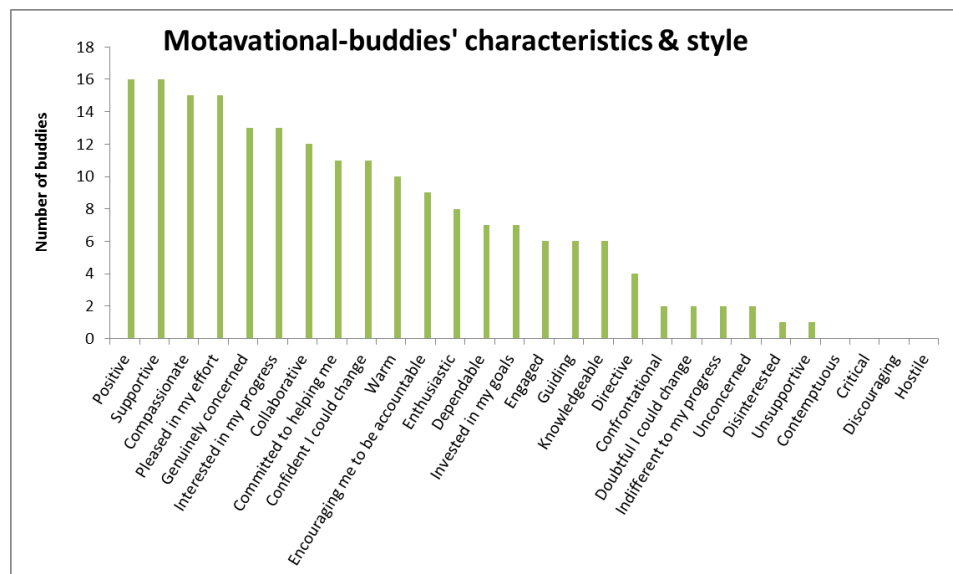


Figure 42: Histogram of participant responses describing their buddy's motivational style

Finally, experimental group participants were also asked to report the amount of time in a typical week that their motivational-buddy provided them with support (in any form). **Figure 43** is a sorted histogram of all the participant responses.

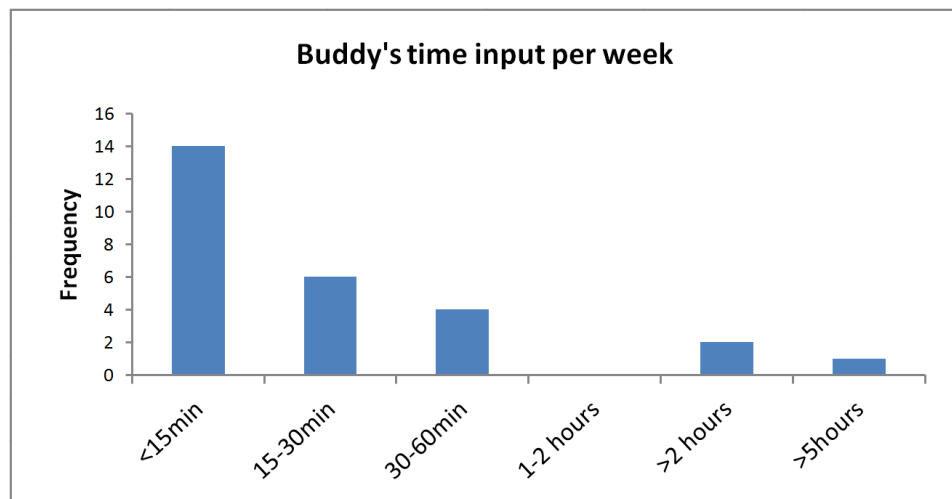


Figure 43: Time in a typical week that motivational-buddies provided input

These results are considered together in the **Discussion** section.

7 DISCUSSION

7.1 Preamble

To help address the persistent and vexing issue of poor *compliance*⁶¹ and *adherence*⁶² to healthy life-style behaviours (in this case physical activity) within the general population, this study employed a 'head-to-head' repeated-measures pragmatic randomised trial of individual-level physical activity counselling employing the Motivational Interviewing style (Miller & Rollnick, 1991) along with pro-active email follow-up. Broadly, the study aimed to achieve two goals: firstly, to demonstrate that an *intra-treatment* social support arrangement (motivational-buddy system) was feasible. Satisfying this first goal required both demonstrating that adequate treatment fidelity could be achieved within a buddy-Motivational Interviewing session (buddy-MI) *and* that such an adjunct to Motivational Interviewing was acceptable to the participant and to the buddy.

The second goal was to test the effectiveness of formally involving a support person or motivational-buddy in the context of physical activity counselling: in terms of measurable participant-centred health outcomes. An auxiliary goal was to report any outcomes that were qualitatively different from 'usual-care' Motivational Interviewing, including any effects that could be seen as bridging between individual and community level

⁶¹ Behaviour that is 'required' or prescribed by others, such as a health professional

⁶² Behaviour that is self-selected and initiated

intervention: sometimes known as ripple-effects, externalities, collaterals or dyadic effects (Smith & Christakis, 2008).

The trial evaluated buddy-Motivational Interviewing and follow-up (a novel experimental adaptation of Motivational Interviewing) compared to usual-care Motivational Interviewing with follow-up (as a proven control intervention) for the advancement of more physically activate lifestyles, over the study duration of one year.

Both groups demonstrated statistically significant and meaningful increases in the primary outcomes of interest, mostly extending out to the 12-month follow-up. While the between-group differences were not statistically significant, the experimental group data indicates a general trend: the experimental group consistently 'out-performed' the control group across all of the main outcomes of interest by (potentially) clinically important increments⁶³. Based on these quantitative findings and with reference to the qualitative data (while also considering the limitations of the study) it is proposed that the intervention met the above stated goals and therefore *does* merit future development and implementation in primary health-care settings. The results supporting this view are reviewed and discussed in detail within this chapter: beginning with the main study findings, their relation to the published literature, to theory, and to practice. Interim summaries and recommendations are made within the relevant sections of

⁶³ These finding and their implications are addressed in detail within the following discussion.

text when it is logical and coherent to do so, rather than necessarily being collated separately at the end of the overall **Discussion**. The reader is invited to refer to the literature review findings, the study results, the interim summaries and recommendations in order to evaluate the different aspects of the study more fully, and in-text cross-references have been provided to facilitate this.

7.1.1 Brief review of the health problem

Physical *inactivity* is a serious and increasing public health problem in most western societies (World Health Organization, 2002; 2004; Gluckman & Hanson, 2006). The evidence is now clear that physical inactivity is linked via a cause-and-effect relationship with a range of negative health outcomes. However, engaging regularly in moderately vigorous or vigorous physical activity involving large muscle groups in the body can offset these negative consequences and buffer against many common chronic diseases and disorders (Booth, et al. 2002). And so, at least in part, the 'cure' *is* known. However, closing the gap between what we *know* and what we *do* is challenging and demanding and motivating individual-level behaviour change remains one of the most difficult problems in health-care.

7.1.2 Hypothesis

It was hypothesised that experimental group participants would increase their daily physical activity levels in the course of the one year trial, and attain and maintain significant increases in cardio-respiratory fitness

compared to standard care (active control) participants, as measured at 12-month follow-up. Also, it was hypothesised that experimental group participants would self-report improved health-related quality of life and report higher general and exercise specific self-efficacy. Implicit in this hypothesis was the requirement to successfully implement the experimental intervention in a technically correct, practical and acceptable way.

The following plain-language summary of the research questions forms a basis for the more technical and specific discussion that follows. The broad questions posed were as follows:

1) Is the novel experimental intervention feasible? Including: Can the intervention be delivered as per the protocol? Can the MI practitioner engage the participant in an exchange that satisfies the quality and fidelity measures such that it can legitimately be called MI? Will buddies' participate and contribute to discussions? Will buddies stay interested and engaged in the programme after the initial intervention period? Will the intervention be perceived as helpful and acceptable?

2) Can the intervention actually improve people's health behaviours? Including: Increasing participants' daily levels of physical activity? Decreasing the amount of time participants sit each day? Increasing participants' fitness levels? Increasing participants' perceived health related quality of life?

3) Is the experimental intervention better than what we already have? If so, in what ways?

7.1.3 Brief summary of methods

A quantitative research method was used, based on a pragmatic, parallel-group repeated measures randomised controlled trial (RCT). The main study was preceded by a comprehensive pilot-study using a non-randomised two-group design. The pilot study focused on refining and testing the feasibility of the intervention and on evaluating process outcomes. The above description gives a brief technical overview of the study. In addition, for the purpose of providing a guide to other researchers as to the level of resources that were invested in the study, a brief overview of the *practical* steps taken to implement the study is provided in **Box 1**.

Practical steps to study implementation

- A review of the behaviour change literature.
- An integrated systematic review of social support interventions and buddy-systems in health-care.
- The design of the intervention schematic and writing of a programme training/implementation guide manual.
- Implementing and testing the intervention in a pilot trial.
- Writing the booklet "*Buddy-basics: Information for motivational-buddies*".
- Scripting, casting and producing the instructional Video "*Buddy-basics: an instructional video for motivational-buddies*".
- Designing and constructing the on-line survey using Survey Monkey™ as the third party web-host.
- Graphic design and colour printing of the recruitment flyers.
- Delivering over 150hrs of video recorded Motivational Interviewing (including receiving on-going clinical supervision and fidelity measurement and fidelity measurement and review, feedback and coaching in MI performance).
- Maintaining the study data-base and sending/receiving over 1000 emails to schedule appointments, send links to the website for scheduled data collection, prompts, feedback and random follow-up. All emails were individually tailored and written in the spirit of tailored and written in the spirit of MI (no bulk follow-up or reminders were sent to the participants).
- Downloading, collating, scoring, cleaning and analysing the data.
- Reporting the findings.

Box 1: A brief outline of the practical steps taken to implement the study

More detailed information can be found on each step throughout the Methods section and various resources can be found in the Appendices.

7.1.4 Sample characteristics

Due to the limited availability of resources and considering the predicted rate of recruitment, it was not possible to stratify the sample for gender or age, although block randomisation was used to achieve participant groups of equal size. As a result, the groups were not balanced at baseline on some characteristics⁶⁴. This was a *pragmatic* trial and as such it sought to strike a realistic balance between internal and external validity (see the more detailed discussion of the study limitations, p. 368). The trial was designed to reflect real-world conditions by recruiting a sample that was representative of those who might typically be involved in such a programme in a similar setting. The entry criteria were intentionally broad but project practicalities dictated an upper (manageable) sample size of about 60 participants. Given these somewhat conflicting recruitment goals, clearly, stratification for age and gender was not possible and statistical modelling has been employed to adjust the estimates of effect accordingly. Balancing the groups' baseline characteristics via stratified randomisation would have required more than a five-fold increase in applicants to be screened (an improbable level of interest for a volunteer-based programme in a university setting).

⁶⁴ The statistical adjustments that this then required have been extensively discussed in the **Methods** and **Results** sections.

7.1.4.1 *Gender differences*

While the statistical adjustments addressed internal validity, from a practical and wider public health perspective (external validity), the gender differences probably still remain important. Overall, females outnumbered males in the trial 45:15 (75%/25% respectively). By group, females outnumbered males 2:1 in the control group and 6:1 in the experimental group. This overall ratio reflects what appears to be a strong gender (self) selection bias that is assumed to be related to the attractiveness or appeal of the programme. This situation is not unique to this study however. George et al. (2012) in their recent review of adult male (only) physical activity interventions found that males are generally under-represented in health-promotion interventions and that males should therefore be targeted specifically (see Morgan et al. 2011 for an example of such an intervention). George et al. (2012) recommended that further research into this population group is required because 'one-size-fits-all' programmes don't appear to appeal to males as much or in the same ways as they appeal to females. Different intervention elements may be required such as an emphasis on masculinity, team-centred components, and friendly competition, individualised programmes based on exercise preferences, encouraging ownership, and allowing males to set unique physical activity goals (George, et al., 2012). Other recent health behaviour change trials by (Hajek, McRobbie, Myers, Stapleton, & Dhanji, 2011) and Cholewa et al. (2008) both recruited mainly females. The physical activity buddy-system intervention by Cholewa et al. (2008) for example recruited an 82.4%

female sample and the Hajek et al. (2011) trial in smoking cessation recruited a 90% female sample.

In this study, there was also a difference in the gender ratio between-groups⁶⁵. This occurred in part due to chance, but also due to six male participants withdrawing *between* randomisation to the experimental group and the first scheduled appointment. These applicants were not retained or included in the intention-to-treat analysis in any way, because there were no data collected. Further, typically either no reason was given or the participant simply reported that they could no longer recruit a buddy, despite understanding previously that this was a pre-condition of study entry (pre-randomisation). When the vacancies created by these withdrawals were re-allocated, the experimental group was again exposed to the same female-biased gender ratio as before, which tended to widen the between-group gender difference.

These male participants either had genuine difficulty in engaging their buddy (when it actually became necessary) or there was some element of the motivational-buddy programme that didn't appeal, hence they withdrew when they failed to be assigned to the one-on-one MI group (that they had perhaps preferred all along). On balance (considering the 75%-25% gender

⁶⁵ In total, 55 respondents (31 male, 24 female) were excluded from study entry for the following reasons: 28 respondents (16 female; 12 male) declined after reading the full study details and disclosures (of which 9 people stated it was because of the potential to include the buddy component and 6 (all males) of these withdrew after randomisation but before treatment), 9 respondents were scheduled to return overseas during the study period, 11 respondents reported being too active already or had no issues with motivation, and 10 respondents never replied to two successive email prompts and reminders.

split) it seems likely that the buddy-MI intervention was less attractive to volunteering healthy males than one-on-one MI. The importance of these gender differences and the (perhaps small) modifications to programme design that might be required cannot be overstated. Again, from a whole population health perspective, a programme that is not at least reasonably attractive to both females and males is severely limited in reach. This does not necessarily imply fault with a programme, rather that different people may find different aspects more or less appealing and for some people, they may simply need something else.

7.1.4.2 *Ethnicity*

Ethnicity was another demographic that was not fully representative of the New Zealand population. The participants were mostly New Zealand European (83%) with only two participants (3%) reporting to be Māori. Therefore, little comment can be made specifically regarding the intervention's appeal to Māori people or other numerically minority ethnicities in New Zealand. The intervention and context were certainly intended to be trans-cultural as Motivational Interviewing does explicitly honour autonomy and people's right and absolute ability to decide about their own actions. However, the appeal and effectiveness of the buddy-intervention to different ethnic groups has not been demonstrated here one way or the other. It is *possible* that the buddy-intervention could be more effective in a population in which a more collectivist world-view is the

norm, however recruitment strategies might need to be adapted for best effect and this potential remains untested.

7.1.4.3 *Smoking status*

Smoking status was gathered in the general 'sweep' of baseline characteristics but the recruitment of only one smoker (buddy-group member, who quit before the end of the study) is unrepresentative of the general population. Of course the study was not targeted towards smokers in any particular way and no particular pattern was observed across the respondents.

7.1.4.4 *Physical limitations*

The final sample demographic, physical limitations, is of particular note. In total, seven participants (11%: n=5 experimental, n=2 controls) reported that they had a medical or other condition that prevented them from undertaking physical activity completely without restriction, to the level that they would like. With respect to the integrity of this pragmatic trial, it was considered important to include people with limitations as this reflects real-world contexts.

The inclusion of people with a physical limitation was also not balanced between the groups (more in the buddy-group) however this was adjusted for statistically. What may not have been captured were any differences in the degree-of-difficulty that these participants experienced with their change process, compared to non-impaired participants. It may be that the

buddy intervention is relatively more effective the more difficult the change task (people making easy changes probably need less help), but the sample size was too small to answer this question. It was shown however, that on average, people with physical limitations exercised significantly less than those without but that they did still increase their activity during the study. Further studies could explore the relative effectiveness of buddy-MI in populations characterised by special needs, where the *objective* degree-of-difficulty might be quite high.

7.1.4.5 *Interim summary: demographic differences*

All of the differences described above have implications for future programme generalisability into real world contexts particularly in terms of fine-tuning the intervention design and implementation strategies with a view to improving programme reach. This includes optimising the attractiveness of the programme to different groups with a view to improving overall effectiveness (and/or applicability to different health behaviours).

7.1.4.6 *Choice of the therapeutic style*

In terms of the choice of the therapy style employed in the intervention, Motivational Interviewing was considered to be a good *fit* but of course it is not the only possible option. It is likely that the buddy-system could be used with other styles of counselling and/or psychological therapies⁶⁶. The so called 'Dodo bird verdict' (Rosenzweig, 1936) (common factors theory)

⁶⁶ For example cognitive therapy, cognitive-behaviour therapy, 12-step facilitation etc.

posits that most of the positive effect that may be gained from psychotherapy is due to factors that most of the different styles or techniques or methods have in common, namely the therapeutic relationship (Luborsky, et al., 2002). However, Chambless (2002) for example, argues that there is much evidence that specific therapies are helpful to specific people, in specific situations, with specific health problems, and programme evaluators and policy makers need to view treatments from outside of a one-size-fits-all paradigm. Emmons and Rollnick (2001) advance the view that MI is by its very nature individually tailored and that it has wide applicability across specific target groups and individuals in specific situations, with their individual specific health problems and related target behaviours.

Three strengths of MI make it attractive to this format and to potential primary-care contexts: (1) it is a brief intervention (typically 1-2hrs of contact time) which generates a relatively small support-person burden⁶⁷, (2) it is client-centred and flexible, and (3) it can be learned by a wide range of health practitioners⁶⁸ (as well as people from outside the health system) and it does not require student/practitioners to have high-level knowledge or academic degrees in psychology (Miller & Rollnick, 2002, 2004; Rollnick & Miller, 1995; Rollnick, et al., 2008a).

⁶⁷ Compared to some therapies requiring up to 16 or more sessions.

⁶⁸ Including nurses, dieticians, doctors, nutritionists, health promoters and educators.

Emmons and Rollnick (2001) conclude that the overall effectiveness (or efficiency) of any intervention based on a therapeutic relationship is dependent on both the skill acquisition of practitioners (how readily the method can be learned by a range of different practitioners/providers) and then on the actual behaviour change of the clients/patients (the method must be suitable and have the potential to induce behaviour change for the specific person-situation-problem). Therefore, when considering programme generalisability, ensuring that the former *can* be achieved is paramount and MI's *trainability* is a strength.

In addition, this study used scheduled and random pro-active email follow-up and prompts as a therapeutic component of the intervention. While MI is generally delivered face-to-face, it can also be delivered by phone and via written emails (Bombardier, et al., 2008; van Keulen, et al., 2008). In practice, this meant that all email communications needed to be written in the spirit of MI and all communications needed to be 100% MI adherent (as would be the case if they were being delivered face-to-face). This included emails that might normally be categorised as administrative. Great care was taken to ensure that all correspondence was personal, tailored, collaborative, goal oriented, consistent in its use of language (e.g. supportive, conditional, hypothetical) and designed to strengthen the individual's motivation for change: even when communicating administrative matters. This approach is very different from systems that use automated mail-outs and generic prompts. The resource requirements

of this pro-active email approach should not be underestimated nor should its importance⁶⁹. Managing the email prompts and follow-up required a significant investment of time and effort. In order to provide continuity of care, it is suggested that the same therapist who delivers the face-to-face intervention components should also deliver the email components. The workload that this might represent in real world contexts (outside of a research trial) is not exactly known, however sustainable case-loads might be relatively modest.

7.1.4.7 *Interim summary: therapeutic style*

Considering all of these factors together, MI does appear well suited to this style of buddy system physical activity promotion intervention. Its strengths include that it is a brief intervention, it is client-centred and flexible and inherently individually tailored, and it can be learned by a wide range of health practitioners and it can be delivered using a range of different modes. It is suggested that MI can also be modelled to support-people or motivational-buddies (as was the case here) via intra-session modelling of MI consistent behaviours and *spirit* (therapeutic style) and via training videos and other resources⁷⁰.

⁶⁹ The effects of this component of the intervention could not be measured distinctly from the overall programme, however many participants cited the follow-up emails as having been helpful, and exerting a positive influence on their motivation.

⁷⁰ It is noted that while these methods were actively used in this study, testing the actual effectiveness of these training methods was beyond the current scope.

7.2 *Discussion of the main findings*

For the purpose of this discussion, the main outcomes have been re-grouped into four 'interpretive' clusters or themes, rather than being presented line-by-line as they were analysed and subsequently reported in the **Results**. The findings are then summarised and the implications discussed. The four groups of outcomes are ordered as follows: (1) the *behavioural/physical* group of outcomes, (2) the *psychological* outcomes, (3) the *theory* group of outcomes and (4) the *buddy-related* outcomes.

7.2.1 *The behavioural/physical group of outcomes*

Fundamentally, the aim of the programme was to change individual participant's behaviour. In this regard the amount of time that participants spent engaged in physical activity, in their free time, of their own choice, was the outcome of greatest interest. It has long been suggested that for health benefits, only leisure time provides the opportunity to meaningfully increase physical activity participation (Morris, et al., 1973; Paffenbarger, et al., 1993; Paffenbarger, et al., 1978). **Figure 14** (p.198) in the previous chapter provides an overview of the (theorised) predisposing or causal pathway between physical activity and health, and a number of ways in which measurements can be taken to evaluate change over time. The behavioural/physical cluster of outcomes is so grouped here to describe

what participants apparently *did* in response to the intervention⁷¹ and then what changes occurred *physiologically*. The findings relating to the behavioural/physical outcomes are discussed below with specific mention of between-group differences and within-group differences as appropriate.

The behavioural/physical outcomes:

1. Leisure time physical activity
2. Total physical activity
3. Time sitting
4. Fitness
5. Body mass

In both groups, all of the above outcomes indicated that on average, statistically and clinically favourable shifts did occur. The novel experimental group outperformed the control group on all but one of these outcomes (although the differences were not statistically significant). Of the behavioural/physical outcomes, *leisure time physical activity* (the variable TMODEqv) is presented here as the most proximal, responsive and relevant indicator of exercise behaviour change. As the intervention is of a behavioural/motivational nature, volitional changes in physical activity, all things being equal, best reflect motivational change. As can be seen in **Figure 28** (p.257), both groups increased their leisure time activity steadily out to three months and participants were on average significantly more

⁷¹ Note that in the Results section the outcome FITNESS was presented first and used as a fully worked example to demonstrate the statistical methods. Here, the outcomes have been re-ordered to structure the discussion around the behavioural outcomes first and the more down-stream outcomes thereafter.

active at all-time points compared to baseline. It appears that participants' leisure time activity regressed only moderately between three and twelve months. It should be noted that motivational interviewing was not the only component of the intervention. The intervention included proactive email follow-up and also the on-line self-reporting of physical activity and health status (arguably an intervention component also).

Figure 28 shows that the greatest rate of change occurred in the zero to three month period for both groups and the experimental group appeared to outperform the active control group over this period, although the difference was not statistically significant. **Figure 29** (p.259) shows that participants' estimated average total physical activity per day (measured as MET-min/day) increased in a similar pattern to their leisure time activity (as the two are obviously correlated). Leisure time activity excludes the domains of *work* and *domestic* activity but includes *active transport*, and is theoretically the domain most directly influenced by behavioural interventions. For example, it would be uncommon for a person to change their job solely for a more active job but relatively more common for people to add exercise to their weekly schedule including perhaps walking or cycling to work.

Also related, **Figure 30** (p.262) shows the participants' estimated average total time spent sitting inactive per day. In a similar pattern to participants' physical activity, participants' sitting time changed favourably. Similarly,

Figure 31 (p.264) shows that on average, participants lost weight (although weight loss was never a specific goal of the programme, many participants adopted weight loss as a personal goal). The weight loss in the control group was not significant at any time point however the mean weight loss in the experimental group was significant at 12-months. Together, these effects⁷² are illustrated in **Figure 44**.

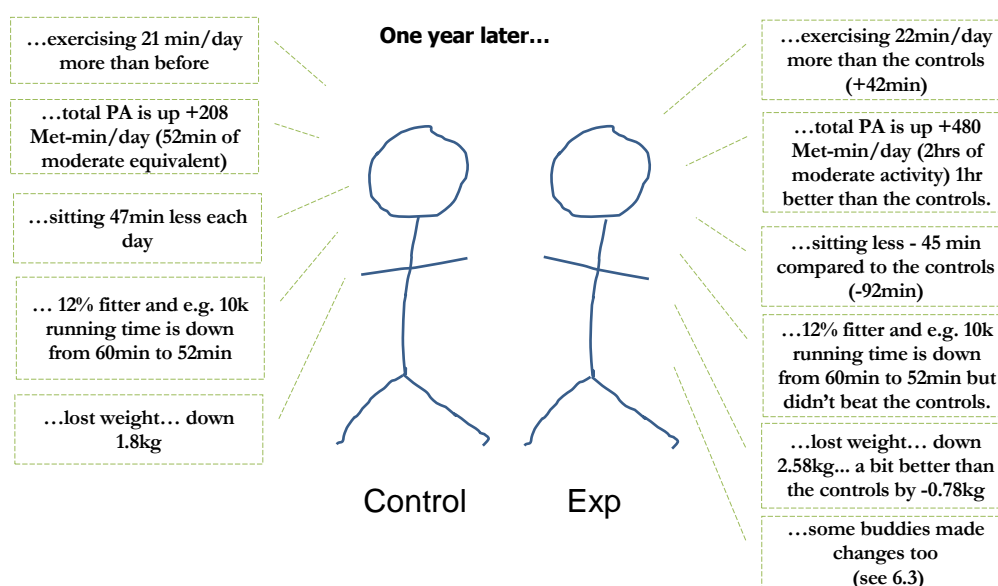


Figure 44: Overview of the behavioural and physical outcomes by group

⁷² Based on the adjusted estimates for leisure time activity, total activity, time sitting, cardiovascular fitness and body weight.

Table 34: Summary of behavioural/physical changes over time compared to baseline

Variable	1-month	3-month	12-month	p-value*
Leisure PA	Mean	Mean	Mean	12month
CTRL (min of moderate)	+21	+38	+21	$p=0.05$
EXP (min of moderate)	+31	+53	+42	$p=0.007$
Total PA[†]				
CTRL (Met-min) [mod-min]	+167 [+42min]	+234 [58]	+208 [52]	$p=0.0008$
EXP (Met-min) [mod-min]	+340 [+85min]	+496 [2hrs]	+480[2hrs]	$p=0.001$
Sitting				
CTRL (min)	-26	-88	-47	n/s
EXP (min)	-54	-100	-92	$p=0.01$
Fitness				
CTRL	+3.5%	+10%	+12%	$p=0.001$
EXP	+8.4%	+11%	+12%	$p=0.001$
Weight				
CTRL (kg)	-0.05	-0.2	-1.8	n/s
EXP (kg)	-0.17	-1.48	-2.58	$p=0.006$

*Within-group compared to baseline. No statistically significant between-group differences.

[†]Total physical activity first in Met-min/day then converted to moderate intensity exercise equivalent.

Several points are considered together here to shape the conclusions about the behavioural/physical group of outcomes overall. This discussion centres around two methodological/statistical/philosophical questions relating to the estimates of effect: in stating that it is very probable that a *true* between-group effect has occurred as a result of the intervention, then (1) has either a Type-I error occurred (a difference is reported, but there is no difference: due to bias, confounding or chance) or (2) has a Type-II error occurred (no difference is reported, but there is a difference: due to an insufficient number of people studied)?

While there is often great emphasis placed on the need to *avoid* Type-I errors, there is also concern that conventional hypothesis testing based on significance levels tends to treat questions in the behavioural sciences as all-or-nothing effects, depending on whether *p*-values exceed the critical limit or not (Garamszegi, 2006; Kazis, Anderson, & Meenan, 1989;

Rosnow & Rosenthal, 1996). Garamszegi (2006) suggests that considering the overall pattern of findings may reveal that a particular effect is small, but still biologically important, whereas, the all-or-nothing approach may lead the investigator to conclude that the hypothesized phenomenon simply does not exist at all.

Research should benefit people in ways that are clinically and/or practically significant, that is in ways that matter to them. Here, this idea can be formulated as a two-part question. Firstly, with regard to feasibility "is the experimental intervention at least *as* effective as the standard intervention (already known to be effective)? In other words, "can buddy-MI be done?" Part two of the question then is "if it can be done, does it offer any advantages over the standard treatment?" In this case, the answer to part two of this question goes beyond null-hypothesis significance testing (discussed further below).

Schmidt and Hunter (2002) assert that relying solely on significance testing, particularly in the field of psychology, "almost invariably retards the search for knowledge by producing false conclusions" (p.65). Schmidt and Hunter (2002) stress the importance of avoiding a Type-II error: failing to detect or report an effect that is there. Schmidt and Hunter (2002) argue that the average level of statistical power in psychological research is low, between 0.4 and 0.6 and the all-or-nothing decision rule made by researchers is commonly flawed. Schmidt and Hunter (2002) also assert

that no single study is ever sufficient to support a conclusion and that multiple studies and the use of meta-analytical methods are ultimately required.

Largely, these issues of statistical power (sample size) result from the challenges that were faced in recruiting participants to the trial and the tight resourcing available. Generally, an experimental trial with a small sample size is more likely to show that there is no statistical difference between groups or association between variables, when in fact there may be (or is) a difference or an association (a Type-II error). In contrast, a sample size that is too large leads to unnecessary expenditure of time, effort and finance (Patel, Doku, & Tennakoon, 2003). Essentially the trial was run by one person and the sample of 60 participants created a full-time workload. A power calculation was conducted *a priori* and the study was powered at the 0.8 level to detect the expected within-group mean differences, however being able to detect the between-group differences *was* known to be optimistic from the onset. To off-set this limitation, the repeated-measures design employed ensured the opportunity to observe any changes in the estimates of effect over four time-points. Importantly, this temporal dimension greatly increases the utility of the data as it allows the researcher/reader to observe patterns and trends that are otherwise obscured by single point-in-time estimates.

Undoubtedly, if a no-treatment group had been chosen for the control, then all results for the primary outcomes would have been statistically significant as it has been clearly demonstrated by Conn et al. (2011) that the average effect-size in no-treatment control group physical activity trials is zero (indicating that it is relatively rare for people to spontaneously change their exercise behaviour). Here, all of the estimates of effect across all outcomes at all time-points for the buddy-motivational group differed statistically significantly from zero.

While it is possible to conduct and report post-hoc analyses at selected time-points (i.e. where the groups appear most divergent, using one-tailed *t*-tests) this provides little more information than reviewing the point estimates, confidence intervals and slope of the trend-lines but such tests are not appropriate if not specified *a priori* (Ringwalt, et al., 2010). Further, 'finding favour' at the shorter time-points also undermines the idea that individual-level behaviour change interventions must be able to confer an effect that lasts meaningfully beyond the initial contact phase, otherwise their cost-benefit is likely to be difficult to justify. Nevertheless, 'clinically important change' is a relative concept as an important change for the patient may be one that represents a meaningful reduction in symptoms or improvement in function or affect, but for the provider or funder, the threshold may be set higher (Kazis et al., 1989).

7.2.2 Interim summary: physical/behavioural outcomes

Taken together, the five outcomes in this behavioural/physical group share a common pattern: that the participants in both groups generally improved and those participants in the experimental buddy-Motivational Interviewing group generally 'out-performed' the usual-care. **Table 34** summarises the physical and behavioural outcomes. Participants' estimated average fitness levels increased by a significant amount (within-group). Participants in both groups finished the trial, on average, functionally fitter by approximately 12%. Leisure time activity/exercise increased in both groups and on average, buddy-group participants exercised 22-minutes per day more than control group participants. Participants' total activity levels increased and buddy-group participants reported being moderately active on average about an hour more per day than control group participants. At 12-months, participants spent less time sitting per day: on average, 47-minutes less in the control group and 92min less in the buddy-group. Finally, participants in the buddy group reported losing an average 2.58kg at the 12-month follow-up compared to control participants achieving a 1.9kg average reduction.

As reported already, the between-group differences did not reach statistical significance. However, the estimates of five different measures that reflect behavioural changes (either directly or indirectly) all indicate a trend towards greater treatment effectiveness in the experimental group. In weighing the strength of this evidence, it is suggested that the statistical

precision be considered alongside the practical significance/effect size as well as the overall *convergence* of the five estimates of effect. In formulating conclusions generally, the onus sits firstly with the researcher to present the findings completely and concisely and then with the reader, to make his or her own judgment as to the validity and usefulness of the information so presented. From a philosophical perspective this can be seen to be dependent on the orientation of the burden of proof: whether it is to protect against harm or to ensure that a potentially important opportunity is not lost.

The proposition here is that it is probable that a between-group effect occurred (at least across these primary outcomes) and to rely only on the *p*-values tenders a type-II error. The statistical hypothesis test found the experimental intervention to be *no different* to the already proven control intervention (i.e. it was effective). The *pattern* of findings tends to indicate that the experimental group out-performed the control group. The reader is encouraged to consider the plausibility, consistency, size and temporality of the apparent effects, as well as the *p*-values. Ultimately the reader must decide if the hypothesised phenomenon occurred or not and whether or not further research is warranted.

7.2.3 The psychological group of outcomes

7.2.3.1 Health-related quality of life

The current concept of health-related quality of life (HRQOL) acknowledges that people rate their actual situation in relation to their individual expectation (Greenfield & Nelson, 1992). HRQOL is a concept that tries to embrace peoples' subjective judgements of their level of health or health status, across multiple domains including: physical functioning, role limitations due to physical health, bodily pain, general health perceptions, vitality, social functioning, role limitations due to emotional problems and mental health (Ware & Sherbourne, 1992). In this context, the importance of interpreting changes in health status has a central role in programme evaluation.

The SF36v2 (owned by Quality Metric, USA) is a multi-purpose, self-administered short-form health-related quality of life survey that yields an 8-scale profile of physical and mental function (Ware, et al., 2007) and it was used here in differentiating the health benefits associated with the different treatments. Only the summary scores were analysed: firstly the physical component summary (PCS) and then the mental component summary (MCS)⁷³. Physical activity can be seen to act across both the physical and mental health domains. The evidence is now clear that moderately vigorous or vigorous physical activity is linked via a cause-and-

⁷³ On the PCS and MCS scales, higher scores represent better self-perceived physical/mental health.

effect relationship with a range of positive health outcomes: conferring beneficial effects on up to 20 chronic diseases as well as enhancing mood and functional capacity (Booth et al., 2002). These benefits can interact in reciprocal-causation type relationships.

Studies within the social sciences need to, and often do, include these broader patient-centred outcomes in an effort to circumvent reductionism and so *soften* the limitations of the biomedical model. Patient reported outcomes such as HRQOL are intended to provide added value to the biomedical outcomes (Osoba, 2011). The SF36v2 data was included in the analysis as a primary outcome because of its ‘motivational relevance’. According to most of the mainstream health behaviour-change models, subjective constructs such as *intention* and *self-efficacy* greatly influence behaviour and these are linked to individual’s self-concept and self-perceived health status (and the perceived threat of disease) (Fishbein & Yzer, 2003). An understanding of how HRQOL changes in response to an intervention may aid future intervention refinement. Such refinements may be able to target specific beliefs that lead to increases in certain HRQOL domains and these may in turn help to further mitigate the twin problems of poor adherence and behavioural regression that are commonly associated with physical activity promotion programmes. One of the problems associated with initiating physical activity programmes is that participants often find the physical activity difficult (uncomfortable/painful) and the biophysical outcomes slow to accrue (e.g. weight loss takes time). For

example, in this study, the experimental group's average BMI declined steadily during the trial but it took 12-months before the effect reached a statistically significant level (see **Figure 31**). Conversely, a change in a person's perception can take place within one motivational conversation (Miller & Rollnick, 2002). Improved physical function can improve mental function and vice versa (Booth et al., 2002).

The fairly modest sample size in this study did not provide for sufficient power to meaningfully analyse the 8-scale profiles, therefore the analysis used the aggregated scale summary scores, the physical component summary score (PCS) and the mental component summary score (MCS) to provide estimates of effect and some insight into participants' changing perceptions of their health over time.

7.2.3.2 *Physical component summary scores*

The physical component score summarises the *physical functioning, role limitations due to physical health, bodily pain, and general health perceptions* sub scales. On the PCS scale, higher scores represent better self-perceived physical health. Participants in both groups reported improved outcomes (**Figure 32**). Also, most of the effect was evident by the three-month follow-up. For the non-buddy group, the change in mean PCS scores was fairly modest and this change was not statistically significant. The effect size, Cohen's *d* (0.27) was small. For the buddy-group the mean change in PCS scores was larger and the effect size,

Cohen's d (0.45) bordered on medium (although again not statistically significant). The between-group effect size ($d = 0.28$) also failed to reach statistical significance. The buddy-group effect size, although not statistically significant, was consistent with the 0.5 standard deviation guideline that has been suggested as being universally acceptable in HRQOL research (i.e. the magnitude of change that is considered clinically important) (Norman, Sloan, & Wyrwich, 2003). Overall, the baseline PCS scores were consistent with expected population norms (Stephens et al., 2010; Frieling et al., 2013) (see also the HRQOL summary comments below).

While HRQOL data are usually applied at a population level, further research could investigate specific intervention strategies to use HRQOL data at the individual level. Highlighting individual gains in PCS and relating these to physical activity adoption, maintenance and goal achievement might be reinforcing of behaviour change. Such strategies might include (simplified) self-report HRQOL logs concurrent with physical activity self-reports, with the aim being to strengthen the relationship and enhance motivation towards physical activity maintenance. Self-report HRQOL logs could also be shared between motivational-buddies and participants and/or reviewed and affirmed within Motivational Interviewing sessions. In addition, those participants with a physical limitation had PCS scores on average 7.7-points lower than those who did not, and this was statistically significant ($p=0.008$). For programme

participants who have physical limitations, monitoring PCS scores over an entire intervention period might be a useful way to track progress over time and PCS scores could readily be provided and reported in pro-active email prompts (using feedback in a motivationally consistent format).

7.2.3.3 *Mental component summary scores*

The mental component score summarises the *vitality, social functioning, role limitations due to emotional problems* and *mental health* sub scales. On the MCS scale, higher scores represent better self-perceived mental health. Participants in both groups reported improved outcomes (**Figure 33**). Also, almost all of the effect was evident by the one-month follow-up. In both groups, average MCS increased significantly out to the 3-month follow-up (exp. $p=0.26$; control $p=0.017$) and at 12-months the non-buddy group remained so ($d= 0.61$; $p=0.03$) however (contrary to expectations) the buddy group was no longer significant.

The change in the non-buddy group's average MCS exceeded the 0.5 standard deviation guideline that has been suggested as being universally acceptable in HRQOL research (i.e. the magnitude of change that is considered clinically important) (Norman, et al., 2003). For the buddy-group effect size, Cohen's d (0.26) was small (although not statistically significant). The between-group effect size for the variable MCS is

$d = -0.39$ (i.e. the advantage to the control group) at 12-months (however this difference failed to reach statistical significance). Overall, the baseline

MCS scores were lower than expected population norms (see also the HRQOL summary comments below) and unlike the PCS scores, the participants with physical limitations reported MCS scores similar to those without.

7.2.3.4 *Summary: MCS*

Unlike all of the other primary outcomes, the between-group effect size ($d = -0.39$ at 12-months) favoured the control group (at all the follow-up time-points). On average, experimental group participants started the trial with a relatively low MCS score and despite some rapid improvement in the first month, their scores declined from that point (remaining slightly above baseline but not significantly). A more detailed analysis of the 8-scale profiles might reveal more about the nature of the change (given more statistical power) but the sample size was too small for such an analysis. This finding is in the opposite direction to that expected and there are insufficient data to provide a firm explanation.

It is possible that participation in the experimental group, and the involvement of a motivational buddy highlighted *actual* versus *ideal* discrepancies (or ambivalence) more acutely for those participants with a motivational buddy compared to those participants in the non-buddy group. Being involved in the programme with a motivational-buddy may have resulted in individuals' baseline physical activity behaviours, their values and vision for the future and their health status, being subject to more intense scrutiny than control participants via the mechanisms of

accountability. This may have attenuated experimental participants' *perceived* health status gains, despite making significant gains in there *objectively* measured health outcomes.

Other possible explanations for the results include random error and recall bias. A further possible explanation is that the subjective assessment of the participants' MCS was subject to response-shift effects, whereby health changes lead to shifts in internal standards (i.e., 'recalibration' of expectations), a reported effect in some HRQOL studies⁷⁴ (Schwartz, 2010). However, this effect cannot be quantified without re-administering the baseline HRQOL questionnaire retrospectively ('thentest' study design⁷⁵) (Schwartz, 2010). In any case, the apparent rapid rise in MSC to one-month could be taken advantage of to strengthen the intervention with targeted feedback and affirmations about physical activity gains. Careful review of goal setting strategies might be considered to avoid disappointments and build mastery (Bandura, 1986).

7.2.3.5 *Summary: HRQOL*

The HRQOL scores provide convergent evidence of a treatment effect, although the between-group effect size was not in the direction expected (and no conclusive explanation can be drawn from the available data). Overall, the HRQOL scores were lower than expected population norms.

⁷⁴ A change in the individual's health over time leads to a change in how that individual views his/her HRQOL at follow-up.

⁷⁵ Also known as a retrospective pretest-posttest design.

The SF36v2 scores are normed on 2009 US population data (mean = 50, SD10). Recently, the differences in the scoring coefficients between New Zealand and the US have been shown to be generally quite small (slightly higher in NZ vs, the US) (Frieling, Davis, & Chiang, 2013). However Frieling et al. (2013) concede that it is unclear to what extent the observed differences between countries reflect genuine health differences.

The lower HRQOL scores overall are consistent with main-stream behaviour change theories that relate such factors as peoples' perceived susceptibility to illness, the perceived severity of potential illnesses, the perceived threats, benefits and barriers, self-efficacy, expectations, intentions and cues to action (Bandura, 1998; Becker, 1974; Fishbein & Ajzen, 1975, 2010; Fishbein & Yzer, 2003). Thus, although the recruitment was non-targeted (from an apparently healthy population), some self-selection bias seems evident in the HRQOL data. This likely underpins some degree of the 'readiness' that motivated the participants to volunteer for the study.

7.2.4 *The theory group of outcomes*

7.2.4.1 *Self-efficacy/Exercise self-efficacy*

The General Self-Efficacy Scale and the Exercise Self-Efficacy Scale are both designed to assess individuals' optimistic self-beliefs to cope with a variety of difficult demands in life. Bandura's influential work highlighted the importance that self-efficacy plays in influencing behaviour (Bandura, 1977; Bandura, 1986; 1997; 1998). Bandura (1977) proposed that a self-efficacy belief is a belief that one can perform the behaviour that produces a specific outcome, and that these self-efficacy beliefs are largely determined through personal experiences. Bandura (1977) proposed that self-efficacy is modifiable via information from four principal sources: performance mastery (mastery experiences), vicarious experiences (modelling, including symbolic), verbal persuasion (including self-instruction) and modifying and managing physiological and/or emotional states (see p.44 for a review of the literature). All of these mechanisms are implicitly and/or explicitly employed in buddy-Motivational Interviewing, therefore it was expected that participants' general and exercise-specific self-efficacy would increase over time.

Motivational Interviewing therapists can help to increase individuals self-efficacy by using a range of strategies including agenda-matching, pros-and-cons, scaling questions, envisioning, brainstorming and planning (Miller, 2004, 2010; Miller & Rollnick, 2002; Rollnick, et al., 2008a). In this study, the strategies of *importance-and-confidence scaling* and

envisioning (looking forward/looking back) were almost always used in the MI sessions. Importance-and-confidence scaling questions essentially target self-efficacy beliefs *directly* and the discussions that may flow from this scaling exercise can explicitly identify thoughts and actions that can build participants' self-efficacy. In this way, the self-efficacy scale scores (general self-efficacy and exercise specific self-efficacy) can be viewed as a test of the intra-session therapeutic effect⁷⁶.

7.2.4.2 General self-efficacy

On the Generalised Self-efficacy scale, higher scores represent better self-efficacy. The possible range of scores is from 10 to 40 points and sample distributions are typically right skewed (mean ≈ 29 , SD ≈ 5) (Scholz, et al., 2002). On average, participants in both groups entered the Motivational Interviewing sessions with self-reported generalised self-efficacy scores slightly higher than might be expected in the general population (control = 30.99, SD 3.90 & exp.= 31.16, SD 4.66). For both groups, generalised self-efficacy scores increased significantly over the 12-months and the effect in both cases was large (control $d = 0.8$, $p=0.003$ & exp. $d = 0.94$, $p=0.016$) (**Figure 34 & Table 25**). The between-group effect size however was insignificant ($d = 0.04$, n/s). Taken together, these results suggest that participants' self-efficacy *was* influenced by the intervention programme and it seems likely that most of that influence occurred intra-session. While the intervention was multi-component (MI + pro-active email follow-up +

⁷⁶ This idea is indicative only as there are insufficient data to differentiate and apportion the treatment effects between the intra-session, extra-session and email follow-up components exactly.

the motivational-buddy in the experimental group only) the MI is assumed to be the strongest intervention element and it was common to both groups. While the effect sizes were large (Cohen, 1988) they indicated slightly less change than occurred for the *exercise-specific* self-efficacy scores (see below). This finding is consistent with Schwarzer and Fuchs's (1996) recommendation to add the domain specific questions (physical activity) to self-efficacy instruments: here, the Exercise Self-efficacy Scale (ESE) (Schwarzer & Renner, 2000).

7.2.4.3 *Exercise self-efficacy*

The ESE scale is a 5-item psychometric scale that is designed to assess optimistic self-beliefs to cope with commonly perceived barriers to physical activity. The possible range of scores is from 5 to 20. The frequency distribution of the physical exercise self-efficacy sum scores has been demonstrated to be close to normal (mean = 11.836, SD = 3.779, n = 1,745) (Schwarzer and Renner, 2000).

Like the generalised self-efficacy findings above, the exercise self-efficacy scores at baseline were also slightly higher than might be expected in the general population (control = 13.27, SD 2.91 & exp.= 12.74, SD 2.97). Exercise self-efficacy increased significantly in both groups over the 12-month duration of the study (**Figure 35**).

For the control group, the effect size was $d = 0.96$; $p=0.0004$ (large) and for the buddy-group, $d = 1.21$; $p=0.0002$ (large). Again, the between-group

effect size was insignificant ($d = 0.05$, n/s). On average, females tended to have slightly less confidence than male participants to continue to exercise in the face of perceived barriers ($p < 0.05$).

A comparison of these effect sizes suggests that participants' exercise self-efficacy *was* influenced by the intervention programme and it appears that the physical activity focus of the programme is reflected in the physical activity specific self-efficacy data: and that Motivational Interviewing tends to build both.

7.2.4.4 *Self-efficacy: summary*

It is unknown to what degree spontaneous improvement (or spontaneous remission as it is known in some contexts) may have affected this sample⁷⁷. People are often very sensitive to initial contact, attention and rapport building (Rutherford, Mori, Sneed, Pimontel, & Roose, 2012) and this is likely to be the case here as all such contact was client-centred and in the style and spirit of motivational interviewing. Enquiring about the study, deciding to participate and making an actual appointment can all be seen as 'taking steps towards change' and while these steps might be considered small, they are potentially important mastery experiences. According to Bandura (1977), such mastery experiences will likely increase individual's self-efficacy and this will in turn make the adoption of a new behaviour more likely. It is suggested here that future refinements to the buddy-MI

⁷⁷ In the context of depression for example, 20% or more of patients may experience improvements of 10-15% even without treatment (Posternak & Miller, 2001).

intervention should place high importance on developing self-efficacy strengthening strategies. In this study, the motivational buddies were not highly trained in this area (written materials and demonstration video). However, there is *considerable* scope to develop strategies wherein motivational-buddies are guided in role-modelling, helping participants to modify their physiological and/or emotional states, and helping participants to set up performance mastery tasks. All of which can increase self-efficacy and therefore the likelihood of sustained health behaviour change.

7.2.4.5 *Stage of change*

Prochaska and Di Clemente's (1982; 1983, 1984) Transtheoretical Model (TTM) is one of the most widely recognised and adopted health behaviour change models. Proponents of the model highlight the importance of the stage schema because it represents a temporal dimension. Change implies phenomena occurring over time and this aspect has often been largely ignored by alternative theories. The TTM change process involves progress through a series of five stages: (1) pre-contemplation, (2) contemplation, (3) preparation, (4) action, and finally (5) maintenance⁷⁸.

The TTM was included in this study essentially as a process evaluation measure (gauging participants' baseline readiness for change and tracking their state of readiness over time) rather than for its ability (or not) to guide intervention design and/or implementation. In essence, the TTM *described*

⁷⁸ Although the model is most widely known for the idea that individuals pass through five stages in changing their behaviour, the model also incorporates the additional constructs of 'decisional balance' and 'self-efficacy' and also the ten processes of change (often overlooked).

participants' baseline readiness from the perspective of generalisability. In this sense, it is helpful to know if a (volunteering or otherwise) sample is more or less 'ready' than might be expected. While the validity of many aspects of the TTM have been challenged (e.g. West, 2005), it has been demonstrated empirically, and is generally accepted, that people who are in a more advanced stage are more likely to have changed their behaviour at follow-up, compared to people in an earlier stage (Di Clemente, 2003; 2005). For this reason, it was (reasonably) necessary to be able to report and/or adjust for any between-group differences in baseline TTM scores (readiness). The TTM was listed *a priori* as a secondary outcome (i.e. a measure of effect) however, in retrospect it was found to offer little (the limitations being described below).

As described by Rossi (2000), the simplest approach to conceptualizing stage progression is to count the number of stages progressed as the outcome (regression to an earlier stage is assigned a negative score) and this method was used here. West (2005) points out however, that stage progression is not necessarily uniform or accompanied by a change or increase in behaviour (making its usefulness debatable in repeated-measures study designs). In the context of Motivational Interviewing, knowing a person's 'stage' seems intuitively appealing but in this study, no practical (therapeutic) use was found for the information (beyond the process evaluation already described above). In a typical MI session, the practitioner will likely use a range of strategies and approaches to evoke

client ‘change talk’ and these strategies are much more likely to be responsive to moment-by-moment changes in the client’s focus/direction than to a global category of readiness (Miller & Rollnick, 2009). This is congruent with West’s (2005) assertion; that this knowledge of ‘readiness’ offers no more than simple common sense.

In exactly the same way as has been discussed above, with reference to self-efficacy, participants enquiring about the study, deciding to participate and making an actual appointment can all be seen as ‘taking steps towards change’ and these actions would ‘place’ an individual in the preparation stage. Hence, at baseline, over 83% of participants (correctly) self-reported being in this stage or higher. The participants’ baseline TTM scores were essentially the same in both groups (**Figure 37 & Table 29**). Overall, average stage progression during the study was similar in both groups (one stage). However, a small between-group difference is apparent for participants who regressed (negative stage progression). In the non-buddy (control) group, six people regressed a total of seven stages as compared to three people regressing a total of three stages in the buddy-group.

Unfortunately, the statistical significance of these shifts in progression/regression has not been (cannot be) determined. Debate exists as to the relative weighting attributable to shifts into or out of the different stages (see West, 2005 and Bandura, 1998 for discussion). For example, the cognitive and behavioural strategies and the motivation required to move

from the *pre-contemplation* stage to the *contemplation* stage are likely to differ to those required to a move from *action* to *maintenance*. It is not known if a shift from any one particular stage is equitable to a shift from any other particular stage and how individual's different motivational profiles and goal orientations influence their experienced *degree-of-difficulty* in stage progression.

Even though administering the TTM short-form instrument only requires the addition of one multi-choice question to a questionnaire, doing so still increases participant and researcher burden and potentially adds no new knowledge. It is suggested here that administering the TTM as an outcome measure requires a strong justification. However, using the TTM and in particular the additional constructs of *decisional balance* and *self-efficacy* and the *ten processes of change* (often overlooked) may have merit in other programme designs.

7.2.5 Treatment fidelity: introduction

Broadly, the treatment fidelity measurement and monitoring used in this trial aimed to verify the extent to which the treatment (or experimental manipulation) occurred as planned. Verification of fidelity was needed to ensure that a valid and replicable comparison could be made *between* and *within* the two groups (Moncher & Prinz, 1991). Treatment fidelity strategies help to ensure that potentially effective treatments are not prematurely discarded or unsuccessful treatments implemented (Bellg, et al., 2004). Most importantly here, the trial specified Motivational interviewing *a priori* as the therapeutic counselling style to be used in both the control intervention and the experimental intervention (involving the addition of a motivational support person to the MI sessions). Therefore, it was considered essential to be able to demonstrate that MI was in fact used (not some variant or hybrid or generalised non-specific counselling). In addition, it was considered essential to be able to demonstrate that the addition of the motivational-buddy did not transform the MI into something else. Beyond this, the treatment fidelity strategies employed aimed to optimise (by design and implementation) the delivery of the treatment in a way that was consistent with theory and as practicable. The fidelity strategies were guided by The Behavioral Change Consortium (BCC) developed model comprising five-areas: (a) study design, (b) training providers, (c) delivery of treatment, (d) receipt of treatment, and (e) enactment of treatment skills (Bellg, et al., 2004; Resnick, et al., 2005).

The strategies that were employed in this trial are discussed below⁷⁹. The results are not re-presented here, but in-text cross-references are provided to the relevant **Results** section as well as to other sections of the document where relevant. Firstly, treatment fidelity strategies are discussed as they apply to the first three BCC areas *study design*, *training providers* and *delivery of treatment*. Later in the **Discussion**, aspects of *receipt of treatment*, and (e) *enactment of treatment skills* are cross-referenced and discussed under the heading Buddy Characteristics (p.337). The focus of the latter discussion of buddy characteristics is mainly concerned with describing the nature of the buddy relationships and identifying areas for further development. However, the information presented in that section also informs the discussion of some fidelity. These data are largely qualitative and retrospective and therefore did not provide any opportunity for implementation-adjustments mid-trial. However, sections 7.2.6 to 7.2.9 do provide a reasonably in-depth description of the fidelity of buddies' involvement in the programme.

7.2.6 Fidelity strategies

7.2.6.1 Study design

The study used a repeated-measures pragmatic RCT to ensure that the study could adequately test the hypotheses. Careful consideration was given to selecting participant-centred outcomes and process outcomes that were congruent with underlying theory and the practicalities of the clinical

⁷⁹ The paper by Bellg et al., (2004) has been used as a template to report this section.

process. Being a multi-component intervention, the ‘active ingredients’ were richly described and adequately ‘covered’ by the selected outcomes (within the bounds of the available resources). The following steps were taken to ensure that the same treatment dose was delivered as equally as possible within-group and between the groups: the number, frequency (but not length) of contact was the same for each group, on average, but not necessarily for each subject within a particular treatment condition⁸⁰. And, the intervention was manualised, computer-scheduled, included a separate practitioner training guide, a guide-book for the support people and a demonstration video (see **11.7, 11.8, 11.10**). However, considerable latitude in programme engagement/utilisation was afforded to participants, and their absolute autonomy was respected.

Summary information: For further details of the study design see **5.1.3; 5.3.1; 5.8.3; 5.8.4; 5.9.6** and **5.9.7** and for fidelity results see **Figure 38**.

7.2.6.2 Training providers

This study was implemented by one researcher/practitioner and employed practitioner training that was realistic and replicable. Programmes need to be evaluated using practitioners of known skill level and ability (competency). The training required to consistently achieve such levels of competency in ‘typical’ practitioners needs to be realistically achievable, outside of expert-led research studies (Conn, et al., 2011).

⁸⁰ Some intervention types might be suited to standardisation of length, number, and frequency of contact, amount of information, the scripting of content, and the monitoring of participant-completed tasks, however, a much less structured approach was used in this pragmatic trial.

The therapist/PhD candidate level researcher delivering the intervention holds a Bachelor of Sports Coaching (BSpC) and a Master's degree in Health Sciences (MHealSc) including sports psychology and post-graduate level Motivational Interviewing papers, and had participated in a three-day training workshop specific to MI treatment fidelity coding (but was not a 'health professional' nor trained in clinical psychology). From this baseline, the therapist/researcher received fortnightly feedback (initially, then per/quarter) and on-going coaching from a University-based PhD level MI trainer; a Member of the Motivational Interviewing Network of Trainers (MINT). Supervision/coaching included the review of videotaped session recordings, coding exercises and calibration of coding, observation and coding of MI sessions in real-time and on-going reviews of performance, with a focus on continuous skill development. A therapist skill level of 'competency' was achieved consistently across time (see p.172 and **Table 11** and the related discussion of treatment delivery below). A *scalable* train-the-trainer model would need to be implemented if a community-based programme based on the buddy-MI intervention was to be implemented and an even greater focus on monitoring provider training would be essential.

7.2.6.3 *Delivery of treatment*

With respect to intra-session treatment delivery, the 'gold standard' method was used: the scheduled coding/evaluating of video-recorded intervention sessions according to *a priori* criteria, to minimise 'drift' in provider skills

(Bellg, et al., 2004). The results show that the practitioner's skills demonstrated in the pilot study, halfway through the intervention period and at the end of the intervention period are not significantly different.

The treatment delivery was monitored via the MITI 3.1.1 instrument (Moyers, et al., 2010) as per the standard recommended protocol for the review of recorded MI sessions⁸¹. Fidelity was calculated based on retrospective random sampling of 25% of the total number of interviews in the first quarter (i.e. four experimental and four control group = eight sessions @ 20min) and the last quarter of the intervention period⁸² (see, p.280).

Note: Coding examples of the buddy-MI intervention required the creation of a new decision rule. Practitioner 'reflections' of buddy statements were not coded or counted and did *not* add to the MITI behaviour count ratios. In practice, some buddies tended to 'speak for' the participants and the therapist might reflect these utterances back to either the buddy or the participant or both, as appropriate/natural. However, these reflections were 'lost' from the fidelity data as the coding needed to follow the standard recommended MITI coding protocol. This tended to penalise the practitioner in some instances.

⁸¹ Note that 'training' and 'treatment fidelity' monitoring are separate tasks, but that they may regularly overlap in practice.

⁸² As a default, 20-minute video clips were cut from the session beginning from the last utterances related to the introduction and study background and/or other administrative topics.

7.2.6.4 *Receipt of treatment*

According to Bellg et al. (2004), *treatment receipt* specifically relates to the ability of participants to *demonstrate* during an intervention session that they understand and can perform the behavioural or cognitive skills required (according to the theoretical basis of the intervention). This was not done explicitly throughout this study, although the pilot study did endeavour to address this (see also p. 174). The qualitative data (beginning p.282) does indicate (retrospectively) that participants and their buddies did learn and use a number of motivational strategies. However the collection of post-test only data means that these findings cannot necessarily be attributed to the intervention, nor could they have contributed to correcting ‘intervention drift’ during the study. However, they may form the basis of future fidelity measures. For example, the buddy-motivational strategies listed in **Figure 41** could perhaps be operationalised into a fidelity checklist to be used during the intervention period.

Another way to assess *treatment receipt* could be to record participants ‘successful navigation’ through the various MI strategies used in a particular session (this could be coded along with the MITI coding). For example, a participant’s ability to understand the *importance-and-confidence* scaling exercise could be gauged by their completion of the exercise (i.e. nominating a score, describing why they chose that score and not zero, describing ways to increase the score, etc). However, it is noted that ‘homework’ and ‘check-lists’ are not normally part of MI practice, as

they might be for Cognitive Behavioural Therapy for example (Westbrook, Kennerley, & Kirk, 2007) and it is suggested here that their use be considered judiciously.

7.2.6.5 *Enactment of treatment skills*

Finally, “*enactment* [emphasis added] specifically relates to the extent to which a patient actually implements a specific behavioural skill, cognitive strategy, or motivational state at the appropriate time and setting in his or her daily life” (Bellg, et al., 2004, p.499). As above, this component of treatment fidelity was not explicitly documented throughout this study and ‘homework’ and ‘check-lists’ are not normally part of MI practice. However, one opportunity that could be explored is to gather some of this information via the motivational-buddies (from their perspective). This strategy could also strengthen the practitioner’s relationships with the motivational-buddies and provide opportunities to offer praise and feedback (supporting buddies). Notwithstanding these limitations, the question “what was actually used?” (enactment) can in part be answered by the participants exit survey responses. The following participant comments do indicate that treatment was delivered (treatment delivery), that participants did learn new skills (or at least how to apply existing skills to their behaviour-change endeavours) (treatment receipt), and that at least some of these skills were used by some participants at least some of the time (enactment):

"I have relied heavily on my buddy..."

"Went on bike rides with others to motivate me"

"... I was starting to get lax so linked back in with my buddy for me to be accountable to her again"

"Telling others of my intentions increases the likelihood of me carrying them out as it attaches accountability"

(also refer **Table 30 - Table 33**).

7.2.7 Treatment fidelity: conclusions

Overall, this trial took and planned robust approach to treatment fidelity. With regard to the experimental buddy-motivational intervention, opportunities still exist to better integrate *treatment receipt* and *treatment enactment* measures and strategies, to enhance future iterations of the programme.

7.2.8 Buddy characteristics and outcomes

In the following section, the buddy role is discussed with specific reference to the research questions, theory, and the relevant buddy-related variables that were measured. Also, the inclusion of qualitative data provides some insight about the feasibility, form and function of the buddy component and of participants' ratings of acceptability and satisfaction with the programme.

7.2.8.1 Buddy empathy

All of the participating buddies were invited to complete the Helpful Responses Questionnaire (HRQ) (Miller et al., 1991) via the survey website or by using a pen-and-paper form. The HRQ was used as a brief method of gauging 'buddy quality' cross-sectionally to establish representativeness. Of the 30 buddies initially involved in the study, 24 returned completed responses. Female buddies (n=11) scored on average 2.8 points and male buddies (n=13) 1.5 points (group average score 2.1, SD 1.9). The HRQ data indicated that the buddies were neither stellar nor ancillary in their performance. Miller (1991) originally normed the scale on a group of 190 paraprofessional counsellors and reported a group mean score of 1.5 for untrained paraprofessional counsellors and 3.1 for the same counsellors after a training workshop. The group average in this study of 2.1 is therefore completely consistent with Miller's (1991) findings. The results do indicate a gender difference (female buddies 2.8 vs. male buddies 1.5) however the sample is too small to draw any firm conclusion. Miller's

(1991) sample was predominantly female (153/190) and no gender specific results were provided. It does appear that females scored more highly on this test but exactly how that might have translated into the actual motivational-buddy relationships is not known: other factors might be more important (such as the gender composition of the buddy pairs).

While direct observation is a frequently used approach for recognising and measuring empathy as it occurs, direct observation requires either real-time coding or video review of clinical sessions and this was considered beyond the scope and resources of this study. The primary focus of this study was on participant/client-centred outcomes and buddies were not enrolled in the study as 'subjects' but as volunteer support people and their selection was not under researcher control. This voluntary support-person role was made clear to buddies with the intention being to reduce the burden placed on buddies and therefore make participation more likely. In addition, the HRQ was only administered at baseline, therefore there were no before-training versus after-training measurements taken⁸³.

Overall, the HRQ scores were not overly high (some buddies scored zero) but they probably reflect what could be expected in any similar real-world context. Common examples of low-scoring responses included communicating un-acceptance (ordering, commanding, directing, warning,

⁸³ Questions around buddy characteristics, buddy training and participant/buddy matching are discussed separately (p.320) but the discussions are limited by the comparatively peripheral level of data collection allowed for by the study design.

cautioning, moralising, and advising), highlighting inadequacies (judging, criticising, analysing, diagnosing) as well as denying, problem solving and avoidance (Gordon, 1970). These types of significant-other (buddy) responses have been shown to 'dampen' client change talk (utterances about change) in Motivational Interviewing sessions (Manuel, et al., 2011). By extension, it would appear that optimising buddy language and communication style (to be more empathic) would be desirable and the complexities around these ideas are discussed below.

7.2.9 Buddies' involvement: time, strategies and style

In addition to the buddies' self-reports via the HRQ, three exit survey questions elicited responses from the participants' perspective. These questions probed participants regarding their buddy's *performance* and helping style. The questions used a drop-down-box multiple response format including response items derived from several related sources, namely the Partner Interaction Questionnaire PIQ-20 (Cohen and Lichtenstein, 1990), the Motivational Interviewing with Significant Others (MISO) coding manual (Apodaca et al., 2007a) and the Motivational Interviewing Treatment Integrity instrument (MITI) (Moyers et al., 2010) (discussed previously in the **Methods** section). Briefly, the questions probed about the time invested by motivational-buddies, the types of actions and support provided by buddies and the attributes that buddies demonstrated within their motivational-buddy role.

7.2.10 Buddies' investment of time

Initially, all of the buddies attended the Motivational Interviewing sessions with their participant and this usually represented a 2-3hr commitment of *in-session* time. In addition to this intra-treatment involvement, buddy-participant pairs were encouraged to discuss and develop extra-treatment motivational strategies⁸⁴. This encouragement was offered in ways consistent with usual-care MI, usually as an extension of such strategies as 'confidence and importance scaling' and 'collaborative goal setting'. In the main, it appeared that buddies invested a fairly modest amount of time per week throughout the year, beyond the initial sessions. Only three participants reported that their buddies invested more than one hour of time per week engaging in motivational activities. Ten participants reported that their buddies invested between 15 and 60-minutes per week and the majority (14) reported that their buddies invested less than 15-minutes per week engaged in any motivational activity (**Figure 43**, p.287). However, the *qualitative* nature of this support may have differed considerably from person to person, as might the needs and preferences of the participants, and this could not be captured by the brief questions posed⁸⁵. For example, the needs of some participants may have been adequately met by their buddy adapting their communication style and providing only a few well-timed verbal reinforcements per week. By contrast, other participants may

⁸⁴ As a starting point, buddies were provided with a list of strategies that other buddies had reported using during the pilot study.

⁸⁵ Again questionnaire burden being the potential limiter.

have found that actually having someone to exercise with was the most helpful contribution possible, and this might have required hours not minutes of a buddy's time per week. Another variation on the theme (as suggested by the qualitative feedback) was that peoples' needs may change over time. The following examples from participants summarise these points:

"Think I probably should have chosen a buddy who would also have come running with me - the one I chose was good and encouraged me to get out, but I think someone who I actually ran with would have been more motivating for me."

...and

"My buddy was fully supportive of this programme for the first 4-5 months which placed me in a good habitual position. Once her situation re work changed her contact with me changed also however I felt that I didn't need it so much anymore. It decreased to nothing. After 2 months no contact I was starting to lax so linked back in with my buddy for me to be accountable to her again. Eventually (the last 2months) I didn't need her at all."

Some of these issues regarding participant-buddy fit and waning buddy involvement are discussed further in the next section with regard to buddy skills training and buddy selection.

7.2.11 Motivational strategies

Based on participant reports (frequency of using various motivational strategies and the time invested) it seems reasonable to assume that buddy involvement generally started at a fairly high level and then tapered off

during the course of the one year study. Most of the experimental group participants reported that their buddies had, at least at some time, used a number of the more time-intensive strategies including scheduled exercise together, walk-and-talk, collaborative goal setting and motivational meetings over coffee (coffee catch-ups) (**Figure 41**, p.286). Interestingly, few people reporting using quick prompts via text, email or social media. Given that over half of the participants reported that their buddies were involved for less than 15-minutes per week (at the 12-month follow-up), it must be assumed that buddy involvement generally reduced in intensity or shifted towards the less time-intensive strategies as time went on. The following two quotes indicate this trend:

"My buddy didn't keep up her role and I didn't keep her at it. I think we needed to have regular contact times prearranged in our diaries so that we ensured we'd stay on track."

"After 2 months no contact I was starting to lax so I noticed that when my buddy stopped chasing me up I became more slack about exercising."

7.2.12 Buddy attributes and style

Experimental group participants were also asked to select any number of items from a drop-down menu that described the style of the support and motivation provided by their motivational-buddy and their characteristics. As described previously in the **Methods**, the 28 scale items were drawn from three validated instruments (the Partner Interaction Questionnaire; the Motivational Interviewing with Significant Others coding manual; and the

Motivational Interviewing Treatment Integrity instrument) and used to form an un-validated measure of buddy *support-style*. The 28 items comprise a continuum of descriptors ranging from those attributes considered the most 'positive' to those attributes considered the most 'negative' or unhelpful for behaviour change. Twenty-five participants answered this question and the pattern of responses (**Figure 42**) indicates that buddies were generally perceived to be supportive. The most frequently cited attributes aligned with the supportive end of the spectrum with the attributes *positive, supportive, compassionate, pleased, invested* and *collaborative* being cited by approximately 65% of the participants. Only a small proportion of the participants reported that their buddies had displayed more negative attributes, including *confrontational, doubtful I could change* and *indifferent* (cited by only 8% of participants). No participants reported that their buddies had been *critical, discouraging* or *hostile*⁸⁶. While this measure is un-validated, it does provide some insight as to how buddies were perceived by the participants generally. Further work with the measure might demonstrate its validity as a predictive tool for buddy-participant matching, of it might be usefully applied to identify cases where specifically focused training might help to strengthen buddy-participant relationships. Both applications could help to enhance the motivational effectiveness of intervention pairings.

⁸⁶ Note that only 25 participants answered this question and the non-responders may have been participants who had lost touch with their buddy or for whom the relationship had been problematic, resulting in the relationship being terminated (at least two known cases).

7.2.13 Scope for improving buddy performance

In summary, the intervention was attempting to change buddy-behaviour alongside that of the participant. The focus in this regard was on helping buddies to adapt their support style to be more *motivationally-consistent*. The decline in buddy performance reported by some participants is wholly consistent with behaviour-change interventions generally. However, it appeared that this decline was not universal and some participants reported that the success of the motivational-buddy concept was something they wanted to continue over time. The following quote illustrates this view:

"This programme also gave my buddy who is also my partner great foundations to build our healthy lifestyle together."

It is suggested here that the potential challenges involved in changing buddy behaviour have major implications for the effectiveness of this type of programme generally. Improvements gained in this facet of the intervention could favourably boost the overall effectiveness and efficiency of such programmes. However, a balance needs to be struck when investing in buddy-training so that important resources are not diverted wastefully away from the participant/client.

Two main approaches to improving buddy performance have been discussed in the literature⁸⁷: namely (1) training and (2) improving the

⁸⁷ Also see the **Literature review**, p.142.

buddy-participant fit, and they need not be mutually exclusive. Being tightly resource limited, this study took a relatively low intensity approach to both. The training provided was essentially 'self-help with guidance' along with the printed and video format training materials, and the in-session modelling. The study used *autonomous-selection* as the method of participant/buddy matching⁸⁸. Other possible variations to these approaches include intensive buddy training (individual and group formats) (for example, Fals-Stewart, et al., 2006), multi-level criteria matching, and the formation of new ties within 'common adversity' models (see for example, Albrecht, et al., 2006; Carlson, et al., 2002; Cholewa & Irwin, 2008b; May, et al., 2006a).

7.2.14 *Buddy training*

As already mentioned, this study took a low intensity approach to buddy training and there was probably more that *could have* been done (for example see Patten, et al., 2004). However, the exact amount of training that is necessary to meet the minimal effective dose is not known and it is not possible to describe this association from the limited data available here, and other published studies reviewed suffer from this same lack of process evaluation (and in most cases, studies have not been powered to detect such differences) (Park et al., 2012). Some level of self-help information and guidance seems reasonable and necessary (Carlson et al.,

⁸⁸ In other words, the participant was tasked with selecting his or her 'best choice' buddy and more detailed guidance was only provided when requested.

2002; Fals-Stewart et al., 2006; Hennrikus et al., 2010) although not all studies provide it (West et al., 1998; Albrecht et al., 2006; May et al., 2006b).

Despite the lack of a formal evaluation, some buddies did report finding the instructional video and booklet helpful and that the materials did provide some useful ideas and did prompt self-evaluation of their support style. However, whether or not this actually translated into any therapeutic effect is not known as no evaluation of the training effect or its impact on clinical outcomes was possible, given the limited resources available. Hennrikus et al. (2010) point out that it would always be helpful to know when training has been effective and when it has not, so that the overall fidelity of an intervention can be considered in the context of the overall results. Achterberg et al. (2011) suggest that knowledge (only) behaviour change techniques are not particularly effective with patients generally, therefore it is likely that they may not be particularly effective with buddies either. To help strengthen the training effect in this trial, the intra-session modelling was intended to provide an additional learning opportunity for the buddies but again the study was not designed or powered to test the effectiveness of this training strategy directly.

One probable deficit in the training provided was the lack of specific relapse prevention content and this has been highlighted as problematic elsewhere and a likely contributor to the often observed decline in

intervention effect over time (Albrecht et al., 2006). The terminology *relapse prevention* is common in smoking cessation trials but the concept can be also be applied to physical activity trials when 'inactivity' is framed as the default. Some participant's qualitative responses did indicate that a decline in intervention effect did occur over time: specifically, that some participants relapsed to physical inactivity and their buddy was not sufficiently trained or skilled to correct the situation or that the buddy relapsed to being motivationally-inactive and neither the buddy nor the participant were sufficiently skilled or adequately prepared to right the motivational relationship. Fundamentally, the main focus of the study was on the *initiation* of behaviour change and the intensity of the effort applied to this end was consistently high, however the attention given specifically to relapse prevention training was by contrast less so.

While it seems intuitive that more intensive and focused buddy training should improve outcomes, the practicalities and the potential gains in overall programme *efficiency* are far from clear. One distinctive theme evident in the literature is that partner or buddies' supportive interactions *do* appear to be helpful, as is the absence of partner criticism (Park et al., 2012). Quality training may offer buddies the opportunity to learn the practical skills and relapse prevention strategies that they need to be effective motivational-buddies however the *style* or *spirit* components may

still be resistant to change⁸⁹ (May & West, 2000). Park et al. (2012) concluded that realistically, in most studies to date, even when interventionists have set out to specifically modify partner support and reduce criticism, these buddy behaviours are unlikely to have been changed significantly. Further, Carlson et al. (2002) suggest that in smoking trials at least, support people who have had to *learn* specific techniques in the early stages of a programme may be more likely to return to their *default style* of using more negative strategies such as policing and nagging/shunning, and may eventually decrease their level of empathy and tolerance over time (Carlson, et al., 2002).

Conn et al. (2011) question the effectiveness of the typical training methods that might be practically employed in real world settings, that is, settings that don't have the input and expertise of research staff on hand. Conn et al. (2011) demonstrated clearly in their moderator-analysis that train-the-trainer approaches perform less well on average than expert-led interventions. However, expert-led models are unlikely to be sustainable if trials are to be scaled-up to meet the demands of whole community settings. This potentially applies on at least three levels: on the organisational/institutional level, on the programme level (involving the training of practitioners in the programme methods) and also on the individual participant level (especially in the training methods that can be

⁸⁹ There may also be gender effects: perhaps it is more challenging to change support behaviours in husbands than in wives or to change female patients' *perceptions* of spouse support.

employed to train support-people). It is likely that train-the-trainer approaches perform better in situations when the intervention uses an evidence-based method or model that is clear and learnable by usual-care practitioners, although there are relatively few published data from which firm conclusions can be drawn. Training methods need to be well defined and measurable. If the complexity of multi-component trials is too great and the training demands too high, then the results become dependent on a level of expertise and resourcing that is not replicable elsewhere.

7.2.15 Interim summary: training

Given that all potential real-world applications of buddy-systems in health-care would be resource limited, the relative merits and methods of training buddies needs to be rigorously evaluated. If the unhelpful communication styles and behaviours commonly observed in some intimate-partner pairings are truly intractable, as some would suggest (Glasgow, Klesges, & O'Neill, 1986), then the focus for interventionists may need to shift to refining matching systems and helping participants to select their 'best' buddy.

7.2.16 Buddy selection

Given the probable ceiling effects associated with training people in their motivational role, it would seem logical that selecting better 'raw materials' at the onset may be one way to increase the overall likelihood that the buddy relationship will confer a therapeutic effect. It seems reasonable to

assume that if a motivational buddy is *naturally* positive, supportive, enthusiastic, pro-active, reliable and collaborative then the participant is more likely to benefit from the relationship than if the buddy is less well suited for the role from the onset. Therefore, despite the gains that training may possibly achieve, directing effort towards helping people to select their buddy judiciously is a strategy that would appear to merit further development.

Based on the therapist's impressions and notes from approximately 150hrs of face-to-face intervention, buddies appeared to present as *either* supportive/motivating or mildly confrontational/contemptuous^{90&91}. **Figure**

45 illustrates the two common support styles that buddies demonstrated within the MI sessions. In at least two cases, the participants' partners declined to be buddies as they considered themselves to be unsuitable, and one participant 'dismissed' her buddy during the course

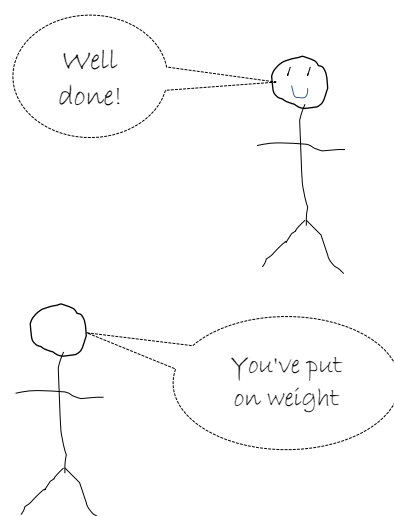


Figure 45: Different support styles of the study, and subsequently re-attended a MI session and then continued the programme solo (as she stated her buddy was unsupportive and she felt she would do better alone). These are small numbers in a small sample but

⁹⁰ Although essentially well intentioned and in good faith.

⁹¹ This dichotomy is perhaps slightly overstated but it was a distinctly noticeable theme.

as initial findings it is suggested that they should not be ignored. The type of buddy relationship and the buddy's style and the context are all potentially related to outcome; however the structure of this relationship is not clearly understood. Gender differences may also exert influences in some contexts, but the small sample sizes in many of the studies conducted to date has made sub-group analyses unfeasible (Park et al., 2012). Further research is needed to optimise the performance of the buddy-system.

As already indicated, this study took a laissez-faire approach to the buddy relationship generally, the intention being to let these relationships play out as they might in real world settings. Participants were given minimal guidance or instruction in selecting their buddy and the assumption was that they would have the knowledge and skills to do so and only when a participant sought more advice was more detailed information and discussions entered into. From a study implementation perspective, this autonomous-selection was efficient. However, participant responses indicated that more input was probably required to help people make the best choice from the potential buddies they have available. None of the studies evaluated in the **Literature review** reported having specifically coached or trained participants in buddy selection (except Cholewa & Irwin, 2008b, using multi-level matching). Generally, participants were invited to bring a buddy along to an otherwise usual-care intervention session or alternatively they were required to recruit a buddy prior to

randomisation as a pre-requisite for controlled trial entry (as was the case here).

When considering the published literature and the qualitative feedback here, it does appear that people generally need more help and guidance to get the most out of a support type relationship. Different aspects of buddy relationships are discussed below with the overall objective being to examine potentially modifiable buddy-relationship dynamics for future intervention development.

A summary of how different buddy relationships might vary in form and function is presented in the four quadrants of **Table 35**. This summary table draws primarily on three recent reviews (Heath, et al., 2012; May & West, 2000; Park, et al., 2012) and provides an overview of the key similarities and differences that might arise within different approaches and programme designs. In the main, the differences relate to the nature and duration of the required support and the likely degree of reciprocity that might be afforded the buddy. The findings suggest that buddy systems can allow two people an opportunity to assist each other in maintaining a health enhancing physical activity programme. An important task then is to determine how different buddy relationship structures can be further optimised to provide high-performance support over time. Questions of value, reciprocity and accountability appear to underpin these issues of buddy performance.

Table 35: Comparing ‘adopting’ vs. ‘cessation’ behaviours by buddy-relationship types

	Cessation behaviour	Adopting behaviour
Common adversity	e.g. Smoking Status = both smoking Actions = quit/stop together, be supportive (up-front), relapse prevention (if needed) Relationship = new tie (stranger) Comments: probably OK for smoking (but some risk of relapse) [<i>not ok for alcohol</i>]*	e.g. Physical activity Status = both inactive Actions = start to exercise together, be supportive (over time), motivate each other (over time) Relationship = new tie or existing (probably spouse) Comments: probably mutually beneficial + good for participant (but some risk of relapse)
	Status = non/never-smoker (buddy) Actions = continue to model abstinence (do nothing), be supportive when needed Relationship = new tie or existing (probably spouse) Comments: probably ‘no return on investment’ in the long term for a non-spouse buddy	Status = active person (buddy) Actions = continue to exercise (active role-modelling)/exercise together, be supportive, motivate over time Relationship = new tie or existing (probably spouse, possibly friend) Comments: probable mutual benefit+ probably provides the best support for participant long term
(active) Role-modelling		

Source: compiled from the reviews of May and West (2000), Heath et al. (2012) and Park et al., (2012).

Key similarities and differences between *adopting* type behaviours and *cessation* type behaviours and the characteristics of *(active) role-modelling* buddy relationships as compared to *common adversity* buddy relationships: when applied to the two different types of behaviour change. An active-role-model is a person who ‘already sets a good example’ and actively helps and participates in a health behaviour with the participant (such as exercising together). A role-model is a person who demonstrates a particular health behaviour as part of their lifestyle, and may be motivating and supportive, but not mutually active with the participant. For cessation behaviours, it appears that common adversity and role-modelling may both benefit the participant/client, however role-modelling a cessation behaviour (continuing to ‘do nothing’) may offer buddies only limited rewards outside of intimate partner relationships, as the buddy arguably has little to gain in the long term. For adopting a new health behaviour (e.g. physical activity), both common adversity and role-modelling may benefit the participant as well as the buddy. Common adversity may offer the buddy similar advantages to the participant whereby the pair can benefit mutually by actually exercising together and ‘pooling’ their motivational resources. The disadvantages here are (1) that neither buddy nor participant have a pre-established habitual exercise routine (‘behavioural security’) and both are potentially at risk of mutual relapse from which they may not recover, and (2) the participant may not receive the high level of motivational support and guidance and enthusiasm that they might from a support person who has a long established habitual exercise routine and who is passionate about role modelling this to others. Active role-modelling potentially offers the participant the best motivational advantage: when the buddy is motivationally consistent and when the buddy habitually performs the behaviour and receives at least some perceived benefit from doing so. Volunteer role-modelling (active or passive) probably offers participants a higher level of motivational support, experience and dependability than do common adversity relationships in the case of *adopting* type behaviours.

* For reasons relating to both safety and effectiveness, Fals-Stewart et al. (2006) warn against using common adversity models in the treatment of alcohol abuse disorders.

7.2.17 *Buddy volunteering: a subjective cost-benefit analysis?*

The volunteering buddy relationship is essentially one of social exchange and Emerson (1976) suggests that the (potential) value inherent in such relationships can be stated in terms of reinforcement:

"The value of a unit of some stimulus (x or y) is the magnitude of reinforcement affected by that unit" (p.348).

If one accepts this most basic tenant of social exchange theory, then engagement in a buddy relationship is essentially determined by a subjective cost-benefit analysis, that is, $\text{outcome} = \text{rewards} - \text{costs}$ (including opportunity costs) (Cook & Rice, 2006). Clearly, for a buddy-relationship to be sustainable, buddies need to value both the relationship and their role within it. Intervention designers should have insight into this cost-benefit equation, as it applies to both the participant and the buddy, and be able to promote the possible benefits.

Buddy relationships vary in both form and function and are invariably influenced by the behavioural context (i.e. the nature of the behaviour to be changed: adopting or cessation). Therefore, the value inherent in such buddy relationships (i.e. what the buddy stands to gain) will likely vary in relation to the different combinations of relationship type and behaviour, and some combinations may be more or less effective and enduring. Relationship types can be broadly characterised as either *common adversity*

relationships (the initiation of new ties including opportunistic and multi-level matching) or *role-modelling* (using existing ties, most commonly a spouse). This study promoted role-modelling (both active and non-active)⁹² as the preferred method. The health behaviour targeted in this study was physical activity and this can be characterised as an *adopting* behaviour. The *change* in this study therefore involved participants adopting and maintaining complex behaviours over time, with the help of a role-model of their own choosing.

The potential rewards offered in this study were principally intrinsic and were probably greatest for intimate partner buddy pairs. In intimate partner pairings, changes achieved probably offer good opportunities for common benefit (within the relationship). In the case of friends partnering together, the rewards may be weaker. In this study the buddy was offered information and instruction in specific communication skills and motivational techniques and it was suggested that ...

“these skills will be helpful in your interactions with the person you have agreed to support, and they may also help you in different areas of your daily life” (Motivational-buddy information sheet, p.1).

Arguably, these are not strong incentives for anyone not already invested in the outcome. The other suggested benefits, were that the programme should

⁹² An active-role-model is a person who ‘already sets a good example’ and actively helps and participates in a particular health behaviour with the participant (such as exercising together). A role-model, generally, is a person who demonstrates a particular health behaviour as part of their lifestyle, and may be motivating and supportive, but not necessarily mutually active with the participant (and technically does not have to be active at all if they can still role-model motivationally sound strategies and provide social support).

be interesting, enjoyable, and rewarding and these benefits might also be seen as relatively low intensity. Another approach to increasing the perceived value of participation is the provision of performance-based financial incentives (providing financial incentives for buddies that are linked to participant's success). While some studies (Donatelle, et al., 2000; Gulliver, et al., 2004) have reported favourable results, the body of evidence is too small to provide conclusive answers. Similarly, other programmes have used paid lay-health-workers to provide social support and follow-up (Funnell, 2009) but in many studies the results were not favourable and declining performance and difficulties with recruitment and retention were reported (Harvey, Steele, Bruggemann, & Jeffery, 1998; Nkonki, Cliff, & Sanders, 2011). It would appear that external rewards may have merit, but they may be complex to implement with respect to providing an appropriately balanced level of external incentive versus intrinsic reward. The extent to which lay health workers will maintain their enthusiasm for the training and actions that programs typically require is not really known.

It is not clear how far altruism alone may go towards maintaining buddy enthusiasm and performance over time. It could be assumed that altruism may be acting within spouse-spouse buddy pairs but it is likely other relationship dynamics are also at play including rewards that are extrinsic or material and/or other negotiated exchanges. Again, these dynamics probably differ depending on whether or not the two partners initially share

the unhealthy behaviour (common adversity) or whether one partner is acting as a role-model to the other.

The importance and value of collateral health effects is an emerging area of research (Christakis, 2004) and this study did provide some qualitative reports of buddy-centred health gains occurring alongside those of the participants (**Table 30** p.283 provides an overview). It can reasonably be assumed that such collateral health effects would represent ‘value’ to the buddies, therefore the potential for positive collateral health effects should be made explicit in future intervention refinements. To fully explore such effects, the programme evaluation would need to include expanded data collection methods to also capture the health outcomes relating specifically to the buddies.

7.2.17.1 Reciprocity

Clearly then, if buddies' engagement and contributions to a programme are contingent upon a favourable subjective cost-benefit analysis (outcome = rewards – costs) then some consideration needs to be given to the facilitation of some such benefits as part of ethical⁹³ intervention design. In practice, examples of such benefits might include increased spousal relationship satisfaction, achieving smoke free or alcohol free status in the home (both for spouse-spouse buddies), friendship, on-going mutual motivation/activation, accountability, engagement in common goals (e.g.

⁹³ “Ethical” is used here in this context because ethically, participants should be given a reasonable chance of success when entering an active intervention arm.

training to go overseas for a hiking trip or competition), economies of child care arrangements, the joy found in giving, fun. It is suggested here that programme designers should go beyond merely *considering* these factors, by actually ensuring that a reasonable degree of reciprocity or at least some mechanisms and guidance to encourage reciprocity are built into study designs. This was not done *explicitly* in this study (and can be seen as a study limitation) although the ideas were included in the printed training materials and implicitly in the demonstration video. Exactly how reciprocity can be operationalised and implemented in a research *or* community context requires further investigation.

7.2.17.2 Accountability

In the present context, accountability can be used to describe any implied or explicit understanding between the participant and the buddy or any ‘rules’ (expectations established collaboratively) that orient the agent’s behaviour (the participant) to the role ‘enacted’ by the overseer (the buddy) (Sharpe, 2000). Two sets of study data indicate that collaboratively established expectations were a feature of at least some of the buddy relationships (although accountability was not formally operationalised and measured in the study). Firstly, several qualitative responses identified accountability as a desirable buddy relationship dynamic. For example, one participant reported that ...

“... later, after 2 months no contact, I was starting to get lax so linked back in with my buddy for me to be accountable to her again.”

... and another

"Having a buddy helps because you have someone to answer to"

and ...

"It is good to have a support exercise buddy to keep accountable to".

These responses suggest that the buddy intervention did induce an expectation of accountability between the participant and the support person (buddy) and that this sense of accountability helped the participants to stay engaged to achieve certain goals.

Session notes and video reviews showed that discussions of accountability strategies can be entered into via a menu of motivationally consistent routes: including 'confidence and importance scaling', 'looking forward/looking back', brainstorming and change-planning (see also Miller & Rollnick, 2002). Accountability strategies typically focused on establishing the style, degree, frequency and type of contact that the participant might like to receive from the buddy. It is concluded here that this aspect of the intervention merits further development and that more explicit training and the embedding of accountability strategies into buddy relationships might be very helpful.

7.2.17.3 Buddy follow-up and prompting

One further and relatively simple way to strengthen the buddy relationships in this trial would have been to provide buddy follow-up and prompting via motivationally supportive emails, in the same way as was done for the participants. Also copying both parties into all emails might have been an effective and time efficient way of strengthening the relationship. This may have helped to maintain buddy performance. However, this strategy hadn't been considered at the time of the ethics application (again the intention had been to allow the relationships to play out naturally) and hadn't been outlined as an option on either the participant or buddy consent forms and therefore it couldn't be implemented after the fact. There were qualitative reports from some participants (during the course of the study) of declining buddy performance and this decline could possibly have been slowed or reversed by proactively prompting and supporting the buddies as well as keeping them informed with all email correspondence. This strategy would not however be without possible privacy and ethical complications. Even within the limited sample and duration of this study, at least three participants separated from their buddy/intimate-partners during the trial and shared communications could potentially become inappropriate for one or both parties and might require one or both to actively opt out.

Another final possibility for strengthening buddy relationships is a staged or overlapping buddy system. That is, where one style of buddy relationship is particularly suited to the initiation of a new behaviour

(where the buddy does attach value to the relationship but perhaps only for a limited time) and another style of buddy relationship is more suited to maintenance (the buddy attaches value to the reciprocity and accountability that the relationship offers over time). For example, in the context of physical activity, a spouse-buddy might provide high levels of support, encouragement and input to help the participant start an exercise programme, but ultimately the participant may need to find a new buddy, an exercise-buddy to be physically active with over time (including for example, joining a club or group, gym, sports team or similar).

7.2.18 Interim summary: buddy selection

The prevailing view is that health behaviour change interventions do need to be multi-component to address different aspects of motivation and/or practicalities (Achterberg, et al., 2011; Heath, et al., 2012). However, the challenge is deciphering which components have the most effect, in which contexts and for whom, and at what cost. Based on clinical observations, notes, video recordings and qualitative survey responses, it is recommended that various perspectives on buddy selection and/or matching should be explored and developed more fully. If one accepts the position that 'significant other' behaviours and communication styles are relatively intractable (Glasgow, et al., 1986; Lichtenstein, Glasgow, & Abrams, 1986) then 'matching' or helping people choose more wisely is an obviously necessary next step. Expanding on *how* this might be done is beyond the scope of this discussion, however some reference to Erik

Erikson's (1959) lifespan model of development, Eric Berne's (1964) theories of transactional analysis and the so called 'Big Five' model of personality (see for example Goldberg, 1993) might be helpful in guiding the development of multi-level buddy screening and matching system criteria, and in the design of methods to help people in choosing the best person to support their endeavours⁹⁴.

Overall, the findings do suggest that many of the buddies probably preformed less well than was anticipated and hence the implementation of the experimental intervention was diluted⁹⁵. The qualitative responses indicate that seven participants experienced at least some level of dissatisfaction with their buddy including diminishing input. Overall, participants reported fairly low levels of time commitment. In addition, therapist observations and notes identified examples of undesirable responses including communicating un-acceptance and highlighting inadequacies. Improved participant guidance towards buddy selection, more intensive buddy training (within limits) and pro-active support may all be effective ways of addressing these inadequacies.

⁹⁴ It is not clear if a person with only a 'poor fit' buddy available should simply go 'solo' or if that 'poor fit' buddy can still be shaped to some advantage.

⁹⁵ In effect, making the between-group differences that were observed even more notable.

7.2.19 Strengths of the research methodology

7.2.19.1 Study design

The study employed a pragmatic randomised controlled trial design (pragmatic RCT) with repeated measures. The pragmatic RCT design provided a realistic compromise between observational studies, which have good external validity (generalisability) at the expense of internal validity, and conventional RCTs which typically have good internal validity at the expense of external validity (designed to clarify efficacy under ideal conditions). The trial was designed to reflect real world conditions by allowing for normal compliance with instructions and intervention elements, by using a proven active control intervention and by analysing results using 'intention to treat' methods. One important feature of pragmatic trials relates to protocol deviation. Protocol deviation or protocol non-adherence by participants is common in real world settings⁹⁶. Examples of protocol deviations are: 'drop-out', 'lost to follow-up', participants not receiving the allocated intervention, and unplanned interruption of treatment. In principle, those characteristics of the pragmatic trial that enhance generalisability tend to decrease the internal validity and the overall likelihood of refuting the null hypothesis. The pragmatic design can therefore be seen as both a strength and a limitation of the study.

⁹⁶ In a per-protocol analysis (mechanistic/efficacy trial) all participants with a protocol deviation would be excluded from the analysis.

7.2.19.2 *The intervention*

Several aspects of the intervention are seen as strengths. The programme used a multi-component intervention design; a common strategy in contemporary physical activity programmes (Heath, et al., 2012). The intervention comprised three clearly defined components, namely the Motivational Interviewing sessions (a proven behaviour change counselling style), the addition of the motivational-buddy to those sessions (including the buddy training materials and in-session role-modelling) and the proactive email follow-up and prompting. All of these components can be clearly defined, manualised (to whatever degree necessary), replicated and measured. The use of a relatively small number of clearly defined components means that future intervention development could focus in any one or more of these defined areas and process evaluation can be simplified by the use of pre-existing measurement instruments (for example, the Motivational Interviewing Skill Code (Miller et al., 2008), the Motivational Interviewing with Significant Others instrument (Apodaca et al., 2007a) and the Motivational Interviewing Treatment Integrity instrument (Moyers et al., 2010)).

It is acknowledged that MI is probably not the only style or method of counselling that could be used in such a programme. However MI appears to be particularly well suited as it is an evidence based collaborative goal oriented style of communication that is designed to strengthen the individual's motivation for change. These characteristics fit well with the

buddy-system concept to form an intervention that appears well suited to physical activity promotion. MI can be learned by a wide range of health practitioners and it does not require student/practitioners to have high-level knowledge or academic degrees in psychology (Miller & Rollnick, 2002, 2004; Rollnick & Miller, 1995; Rollnick, et al., 2008a). Training methods need to be well defined and measurable and even providing effective training for health-care professionals does not *necessarily* translate into measurable health outcomes for patients: many factors can influence a programme's effectiveness (Butler et al., 2013).

A final strength of MI is that it requires no *psychological diagnosis* to be made or any *condition* to be identified; therefore practitioners need only focus on behaviour change. In MI, the practitioner takes the participant/client as he or she finds them. All of these factors are considered as strong justification for the inclusion of MI in buddy-system behaviour change programmes.

The therapist training methods used here included a post-graduate level training workshop, fortnightly feedback and on-going coaching. A therapist skill level of 'competency' was achieved during the on-going fidelity monitoring. This robust approach to therapist training and fidelity monitoring is considered to be a significant strength of the study and an aid to future replicability/ reproducibility.

A final strength of the intervention was the blending of administrative email communications with motivational and supportive prompts. Follow-up emails aimed to include motivationally consistent elements. In a scheduled way, this follow-up was linked to the data collection time points and random prompts and review-prompts were also sent regularly. This subtle use of a motivationally consistent communication style increased the efficiency of the administrative time invested and probably contributed to the high study retention at the 12-month follow-up (93%).

7.2.19.3 Generalisability

In this trial, generalisability of the research findings was a key focus. One of the primary objectives of the trial was to demonstrate that the buddy-motivational interviewing intervention was feasible. This required incorporating an intervention that could be learned and delivered by a non-psychologist practitioner, to real people. It also required the intervention to be sufficiently attractive to people in a disease-free and non-clinical context, and for the concept to be sufficiently attractive to volunteering support buddies. These conditions were met and they are considered strengths of the study.

7.2.19.4 Representative sample

Careful consideration was given to the process of setting the inclusion and exclusion criteria in terms of the validity of the research as well as in terms of the impact that this would have on the recruitment strategies used and the projected rate of recruitment. The use of broad inclusion/exclusion

criteria permitted a representative sample to be recruited. The recruitment was 'passive' and not targeted at any particular sub-group within the staff/student population and both the experimental and control interventions were presented as real and active therapies. All of these factors are considered as strengths here in the context of recruiting from a non-disease specific population.

7.2.19.5 Data collection

The choice of data collection methods was dictated largely by the practical considerations of researcher burden, participant burden, overall costs and logistics. The main data collection method was the use of a specially constructed on-line questionnaire for each group and time-point. This method required a modest investment of set-up time and modest on-going web-hosting costs. The method was logistically simple as participants were simply emailed a new link to the correct questionnaire at each time point and the data-base could be monitored to check for completed questionnaires and/or missing data that needed to be followed-up. This enhanced the completeness of the data as participants generally responded positively to prompts and completed their questionnaires. Overall, the major advantage of using on-line surveys instead of face-to-face interviewing was that the greatly reduced time and cost involved permitted the repeated-measures study design to be used.

7.2.20 Limitations of the research methodology

7.2.20.1 Sample size

The anticipated sample size ($n = 60$) was a balance between available resources and statistical power. Potential threats included participant drop-out, participants 'lost to follow-up', and participants not receiving the allocated intervention with sufficient intensity due to limitations of the available resources. It was also conceivable that the experimental intervention might have been more or less effective with women than with men and that there may have been differences in the dynamics of same-gender and opposite-gender motivational-buddies. However, due to the limitations of sample size, it was not possible to conduct sub-group analyses for factors related to the gender mix within the buddy relationships and some differences may not have been captured.

7.2.20.2 Volunteer population

The participants were recruited from two tertiary learning institutions and both students and staff were encouraged to participate. The question asked in the advertising flyer was "Do you want to increase your physical activity? ... your fitness? ...with the stated aim of the programme being "to help you develop motivation and commitment to physical activity". Therefore, it is reasonable to assume that this volunteer sample was, on average, ready for change or at least contemplating it. Consequently, active resistance to change was rare, in that most participants demonstrated a desire to be more physically active. While it could be imagined that this

state of readiness might make the MI therapist's job 'easy', in reality this is often not the case. Different states of readiness do not necessarily make the therapist's job any more or less difficult: rather they may simply require the use of certain strategies in preference to others. Overall, the participants were adult volunteers with at least some willingness to change their physical activity behaviours, who met various eligibility criteria and who had a relatively high socioeconomic/educational status: therefore the results may not be altogether generalisable to the broader population.

7.2.20.3 Intervention

Under the relatively uncontrolled conditions of the trial, buddies would have varied somewhat in terms of quality (i.e. potential or willingness to provide optimal support). Such differences in quality probably included differences in enthusiasm, conscientiousness, communication skills, empathy, and availability, therefore generally in the level of support they provided: these qualities were not measured directly and buddy quality per se could not be accurately determined. Buddies were provided with training materials and in-session modelling to enhance the support that they provided but some variability undoubtedly remained. Finally, this trial applied the intervention strategy in the context of physical activity, and it may not initiate change in another health-related behaviour.

7.2.20.4 Comparator

It was not possible to control for the formation of 'spontaneous buddies', that is, buddy pairings that may occur naturally. Buddies can and do form

in everyday life and the degree to which this occurred in this study population is unknown. While the possible formation of spontaneous buddies threatened to dilute the experimental intervention effect, it was anticipated that such dilution would not be substantial. It was assumed that buddy relationships most likely existed on a continuum from those control group participants who pair-up with a buddy spontaneously (untrained) to those buddies who were formally engaged in the programme and who were assisted to become predominantly high-quality enduring buddies.

7.2.20.5 Data collection

Overall, the major advantage of using on-line surveys instead of face-to-face interviewing was that of greatly reduced time and cost. However, some disadvantages should be noted including test/re-test validity. The physical activity recall measure used (the IPAQ) is known to be susceptible to desirability and recall biases when self-administered, however there is no reason to suspect that one group or the other would systematically over-report more so than the other. The use of face-to-face interviews to collect IPAQ data does allow for more detailed explanation, guidance and probing when the responses being volunteered fall short of what is required. However, face-to-face interviews are more costly and time-consuming and responses may be influenced by the relationship between the interviewer and the respondent (Patel et al., 2003).

Similarly the measurement of participants' aerobic fitness would have been more accurate if conducted in an exercise physiology laboratory (rather

than using a self-administered field test). However the cost and time commitment involved in using a lab test was considered to be disproportionate to any potential gains in accuracy. Again, within group- and between-group comparisons should be valid.

Finally, the qualitative data indicated that positive collateral health effects did occur for some buddies. However, the programme evaluation did not include the expanded quantitative data collection methods that would be required to directly measure any health effects relating specifically to buddies.

Finally, blinding the investigator and/or the participants to the treatment received was obviously not possible in this trial. However, the measurement and assessment of outcomes was either via objective measures or via self-report instruments, and these were completed on-line and an anonymised data set was then used during the statistical analysis.

7.2.20.6 Response rates

The response rate is the proportion of those approached who eventually agree to participate in research. In this case, the recruitment was passive and it is therefore now known what percentage of people would respond to a pro-active recruitment approach. To quantify the response rate, a further study using a pro-active recruitment strategy delivered in a targeted population would be required.

7.2.20.7 Data analysis

As previously discussed in the **Results**, it was not feasible to stratify the sample for gender or age (or any other demographics) and as a result the groups were not balanced. These differences along with the repeated-measures structure of the data meant that statistical modelling techniques were required to adjust the parameter estimates⁹⁷.

Mixed-effects linear regression was used for the prediction of the parameter estimates and also for describing the influence of selected explanatory variables. However, like most statistical methods, mixed-effects linear regression does have prerequisites and limitations that must always be considered in the interpretation of findings. For optimal results, the method requires that the relationships between the independent variables and the dependent variable are almost linear (Maindonald & Braun, 2007). While the model diagnostic plots (**Appendix D**) confirm a satisfactory approximation, the data were not perfectly normally distributed. Further, for a mixed-effects linear model to be robust and explain y as well as possible, it should include only independent variables that explain a large portion of the variance in y . However, contrary to this principle of parsimony, there are often independent variables that need to be included in the model in any case—such as demographics and other variables that have already been found to be relevant in prior studies (Schneider, Hommel, &

⁹⁷This is not an uncommon situation as medical/health questions often involve the effect of a large number of factors (independent variables).

Blettner, 2010). When the focus of new research is on identifying relationships between variables, then the variables of interest must be included in the model if these potential relationships are to be tested. These competing goals can result in *over-adjustment* of the data and a tendency to reduce the precision of the estimates: however, between-group differences should remain valid. A low coefficient of determination⁹⁸ is less problematic when the estimates (the absolute values) do not need to be extremely precise⁹⁹ (Schneider, et al., 2010).

Linear regression is also limited in its ability to demonstrate causality. The fact that an independent variable turns out to be significant reveals little about causality (Raudenbush & Bryk, 2002). Any apparent relationship among the variables still needs to be considered contextually: including for example the temporal sequence, the strength of the relationship, consistency, any dose-response gradient, and the overall plausibility of the relationship (Hill, 1965). The analysis was also potentially limited by the composition of the study population. In this pragmatic trial, with its relatively unrestrictive entry criteria, there probably were subpopulations that behaved differently with respect to the assigned treatment and some (real) effects may have been masked from the analysis and thus remain undetected. A related problem is ‘missing values’ whereby the *effective* sample size for a particular measure might be appreciably diminished and

⁹⁸ The portion of the variance in y that is explained by the model.

⁹⁹ As was the case here, the within-group and between-group comparisons were important but the absolute values of the dependant variables were less so.

the sample may then turn out to be too small to yield significant findings (despite a seemingly adequate overall sample size).

Some or all of the above limitations may have occurred here. However, the study design, implementation and data analysis were specifically focused on balancing the sometimes competing demands of maintaining internal and external validity: this was done to the extent that could practically be achieved.

7.2.21 Recommendations for further research

There are many aspects of the intervention design and implementation that are potentially amenable to further fine-tuning and evaluation. One area that was not specifically addressed in this study is the probable need to develop culturally appropriate recruitment and engagement strategies– with a view to improving overall programme reach. This would include optimising the attractiveness of future motivational-buddy programmes to different cultural groups (and to both males and females within these groups) with a view to improving *overall* programme effectiveness. Tailoring interventions to different health behaviour change contexts might also require culturally specific adaptations. Although the underlying concept of the intervention is fittingly client-centred, incorporating culturally specific values, traditions, language and family structures into future motivational-buddy programmes may enhance both effectiveness and sustainability.

Probably *the* most significant area still to be investigated is the question of buddy-training versus buddy-selection (matching) as this may directly influence the buddy-participant interaction (probably in *amount* and *quality*) and by implication, the potential size of any therapeutic effect. Approaches to training and matching have been summarised in the **Literature review** (Part two, p.73) and previously in this **Discussion** (see p.345 & p.349). However, this brief re-cap is intended to highlight this important issue once more. The exact amount of training that is required to

meet the minimum effective dose is not known. Further, the optimal training methods are also not known. Defining and operationalising these two training characteristics is an important next step towards ensuring precious resources are not wasted and/or treatment opportunities lost.

Some authors have suggested that buddy-behaviours might be somewhat intractable and that motivational-buddies may quickly return to their default (motivational) *style* when no longer under the influence and guidance of researchers or programme providers (see Carlson, et al., 2002; Glasgow, et al., 1986; Park, et al., 2012 for more detailed perspectives). Such *declining performance* could be seriously detrimental in buddy-motivational relationships. Given that all potential real-world applications of buddy-systems in health-care would be resource limited, the relative merits of training buddies versus selecting *naturally-supportive* buddies needs to be rigorously evaluated. Taken together with previous observations, this study's findings prompt the recommendation that future research initially focuses on refining ways to actively help participants select their 'best choice' motivational buddy.

One further recommendation for research concerns programme evaluation. Opportunities still exist to better integrate *treatment receipt* and *treatment enactment* evaluation measures and strategies, with the aim being to enhance future iterations of the programme. This means measuring how well participants engage with the treatment *within* MI sessions (for example

how well they understand and participate in strategic discussions and hypothetical reasoning) but also actually quantifying and defining the support (treatment) provided by the buddy *out-of-session*. This was done to a limited degree in this study via the exit surveys. However, it is recommended that other methods be developed that provide a measure of treatment receipt *during* the course of the intervention so that modifications can be made if necessary (e.g. if a supportive relationship does not evolve during the intervention period). With regard to evaluating treatment enactment, this should be extended beyond the patient/participant to capture quantitatively the specific behavioural skills and strategies actually implemented by buddies as they provide their day-to-day motivational support. In this type of programme, implementing and evaluating treatment receipt and enactment measures would be methodologically complex but potentially fruitful.

7.2.22 Implications for practice

7.2.22.1 When and why should a buddy be used?

This study used a randomised design whereby participants agreed to participate in either the usual-care Motivational Interviewing group or the buddy-Motivational Interviewing group. The random allocation process therefore did not take into account individuals' preferences or their personal circumstances¹⁰⁰ (e.g. whether or not they already had a support person

¹⁰⁰ A non-randomised parallel group trial would have allowed participants to select their preferred group (and perhaps do better) however the non-randomised trial design is comparatively less robust.

readily available to them and if so that person's characteristics). It is not known what proportion of the potential participants would have chosen the buddy-Motivational Interviewing over the one-on-one intervention if they had been free to do so¹⁰¹. With regard to trialling the programme in a community clinic setting, it is envisioned that the default intervention would be buddy-Motivational Interviewing. Setting this as the 'standard' would probably enhance the up-take. Depending on the behaviour to be changed (the target behaviour, e.g. smoking, physical activity or alcohol) there may be circumstances when programme participants do not have a suitable support person available to them (see **Table 35** for an overview of possible incompatibilities). Qualitative findings from this study suggest that the process of buddy recruitment may be a therapeutic one and some participants reported that benefits accrued even before the first Motivational Interviewing session occurred (via the establishment of accountability, reciprocity and the supportive relationship). It is recommended that any similar programmes should promote the motivational-buddy relationship as *usual-care* while still offering the flexibility of one-on-one consultations when this is indicated.

7.2.22.2 What more do we need to know about buddy-MI practice?

This study demonstrated that the behavioural outcomes and the psychological outcomes improved rapidly at the beginning of the

¹⁰¹ ...or what the up-take might have been if no other choice had been available.

intervention period (in most cases, most of the change had occurred by the one month follow-up). Therefore, it is suggested here that this initial period is probably important for long-term success and that it presents an opportunity for providers to capitalise on perhaps transient states of readiness. Initially, potential clients or participants might take small steps towards change by enquiring about a service or programme, deciding to participate and then making an actual clinic appointment: all of these initial steps can be seen as important *mastery experiences* (Bandura, 1977). All of these experiences can potentially build an individual's confidence that he or she can effect change in the longer term (building self-efficacy) and researchers and clinic staff can strengthen these beliefs pro-actively via positive role modelling and supportive interactions (Bandura, 1977).

One key aspect of this trial was the focus on providing pro-active email support, including prompting and follow-up that aimed to facilitate these initial steps towards change. For the buddy-Motivational Interviewing participants this included providing guidance on buddy selection. For these participants, taking the steps required to recruit a buddy can be seen as *mastery experiences* (possibly quite challenging steps for some people) and as such they often gave rise to additional opportunities for the researcher to provide reinforcement and praise.

One question that remains to be answered is how well this could be incorporated in real-world clinical settings. In this trial, all participant

exchanges were motivationally consistent and in the style of Motivational Interviewing¹⁰². Maintaining this style of interaction in a clinic setting would probably require those performing such 'administrative' tasks to be adequately trained. This might be an unrealistic expectation.

7.2.22.3 What MI teacher training is required?

The train-the-trainer model is commonly employed in hierarchically delivered behaviour-change interventions (Hooper, Froud, Bremnern, Perera, & Eldridge, 2013). Specifically, a health professional or primary investigator on the 'top level' initially trains several health professionals at the next level down to deliver the intervention to a common standard. Each of these second level professionals then delivers the intervention to programme participants at the third level (Hooper, et al., 2013). These methods are common to Motivational Interviewing training and there are many training resources and programmes available including on-line training, in-service training, workshops, University level programmes and clinical supervision and coaching¹⁰³. The buddy-Motivational Interviewing intervention is essentially an adjunct to usual-care Motivational Interviewing, therefore it is envisioned that a modular approach could be taken whereby buddy-Motivational Interviewing is incorporated into standard programmes. The training handbook developed for this study (**Appendix C**) could be used for this purpose. Crucial factors such as the

¹⁰² Many participants subsequently described them as 'supportive' in their exit survey comments.

¹⁰³ Many training resources can be found here <http://www.motivationalinterview.org/index.html>

fidelity with which the intervention is passed down a chain of actors (i.e. primary investigator→health professionals→practitioners) would need to be tested prior to future programme implementation. An important strength of Motivational Interviewing is that it can be learned by a wide range of practitioners and it does not require a degree-level knowledge of psychology (Miller & Rollnick, 2002, 2004; Rollnick & Miller, 1995; Rollnick, et al., 2008a). It is reasonable to assume that the 'buddy' component should not create any significant barriers with respect to training.

7.2.23 Implications for health promotion policy in general

Buddy-Motivational Interviewing can potentially reduce health-resource utilisation, particularly if an optimal balance can be found between investing resources in the buddy (e.g. training and/or selection/recruitment) and providing *direct* treatment for the patient. At the policy level, a greater emphasis should be placed on shaping populations' health behaviours by utilising naturally occurring social capital, using methods such as buddy-systems *and* by continually challenging Western culture's normative beliefs about physical activity¹⁰⁴. These approaches should be incorporated into policy and health promotion philosophies.

¹⁰⁴ That it is 'normal' to be relatively physically inactive.

7.2.24 Implications for physical activity programmes specifically

Observational studies have demonstrated that individuals' health behaviours¹⁰⁵ are influenced by significant others, via social network ties (Christakis, 2004; Rosenquist, Murabito, Fowler, & Christakis, 2010). These collateral health effects, which transfer to others, are known as externalities (Lillard and Waite, 1995; Schaefer et al., 1995). Recent and innovative studies have sparked increased awareness of their importance and of potential applications in health-care, and 'transmitted values' is one theorised mechanism of action¹⁰⁶ (Christakis and Fowler, 2007; Christakis and Fowler, 2008).

Health behaviours/status (e.g. smoking cessation and obesity) have been seen to spread in a large network: in a peer-to-peer fashion, transmitted by spouses, relatives, friends and co-workers (Christakis and Fowler, 2007; Christakis and Fowler, 2008). Buddy-Motivational Interviewing¹⁰⁷ has the potential to 'shift' an individual within or between social networks to a 'position' whereby they might experience the positive influence of significant others' role-modelling and other motivational effects (via the motivational-buddy). Such a shift or modification of social network position could be considered an intervention in its own right.

¹⁰⁵Both negative health behaviours and health promoting behaviours.

¹⁰⁶ Potentially altering a person's perceptions of their own risk of illness, and their perceived norms about the importance and acceptability of certain health-related behaviours (both good and bad).

¹⁰⁷ ...and buddy-systems in general.

Physical activity promotion programmes are generally designed to support people in their efforts to adopt and *maintain* a complex range of behaviours over time. The findings from this study suggest that social influence can be *purposefully focused* (or introduced) to good effect within an intervention such as buddy-Motivational Interviewing. This purposefully focused approach potentially enables continuous-lifestyle-intervention using the self-sustaining social capital that may already exist in 'nearby' social networks¹⁰⁸.

¹⁰⁸ This idea favours 'selection' over 'training' as having the greatest potential to enhance the effectiveness of buddy-participant relationships.

7.2.25 Conclusions: key messages from the research

Individual-level health-focused lifestyle change is typically a rigorous and difficult undertaking and the costs of implementing such changes are often perceived as high and sometimes, insurmountable. These costs can include the input of time, mental effort, physical effort, emotional effort, organisational effort as well as financial inputs and the ‘forgoing’ of things previously perceived as pleasurable (e.g. sugary foods, high-fat foods, alcohol, nicotine, recreational substances, screen-time and inactivity). Commonly, a lot needs to change for an individual to achieve significant and lasting health benefits but change is possible and well-designed health promotion programmes can help people to adopt healthier lifestyles.

In the case of buddy-Motivational Interviewing, programme sustainability is likely to be dependent on multiple factors, including suitable motivational-buddy selection and retention. Developing criteria for the screening and selection of more effective motivational-buddies may increase overall programme effectiveness, if this can be done in a practical way. Screening and matching may need to take into account that different participants will vary in the types of supportive behaviours they find acceptable and beneficial and these factors may also vary across different behaviour change settings. A related task is developing ways to maintain buddies enthusiasm over time.

The overarching principal of the motivational-buddy concept is that of amplification (i.e. a larger total treatment effect for a given health system input, shared in some proportion by both the participant and the buddy). Therefore a key challenge is discovering how to strike the right balance between the resource allocations that can be afforded to the buddy (e.g. screening, matching, training and follow-up) versus those that are needed by the participant. The buddy-system is a simple and (potentially) very low cost addition to a treatment programme. The disease context likely influences the kind of buddy-system best suited. Generally more intensive and long-term forms of buddying are likely to be the most effective.

7.2.26 *Social norms: barriers to change?*

Finally, individual's perceptions of what is 'normal' are typically a strong cue to action. Social norms influence many lifestyle choices and may significantly shape intentions, goal setting and the actions taken. **Figure 46** illustrates what is termed here the *normal-problem*. The normal-problem describes a difference in understanding between what it means to be a *physiologically/behaviourally* normal person (biologically 'correct' and in constant-state) versus a *statistically* normal person (common within the population). It is advocated here that this difference in understanding is a serious impediment to progress in physical activity behaviour change intervention design and implementation: potentially impacting at every point of intervention from the individual level to, in particular, the policy level. With regard to physical inactivity and the health consequences of

sedentary lifestyles, Hills and Byrne (2006) argue, that at least in Western cultures, being physical active (e.g. planned exercise) is misinterpreted as *abnormal* with much of the general population and (by assimilation perhaps) much of the scientific community considering that the sedentary state represents the default, that is *normal physiological function* (Lees & Booth, 2005). Hills and Byrne (2006) extend this position to state that physical activity is often considered as a tool to 'cure' as opposed to representing the norm. They suggest that if physical activity was to be recognised as *normal* and *necessary* for a healthy lifestyle, then, the notion that reduced physical activity is the *cause* of chronic diseases such as obesity and heart disease is much easier to accept.

Therefore, any misunderstanding of the importance of physical activity and exercise (at any level and in particular including policy level) is potentially a serious and significant impediment in the provision of optimal physical activity lifestyle approaches to health management.

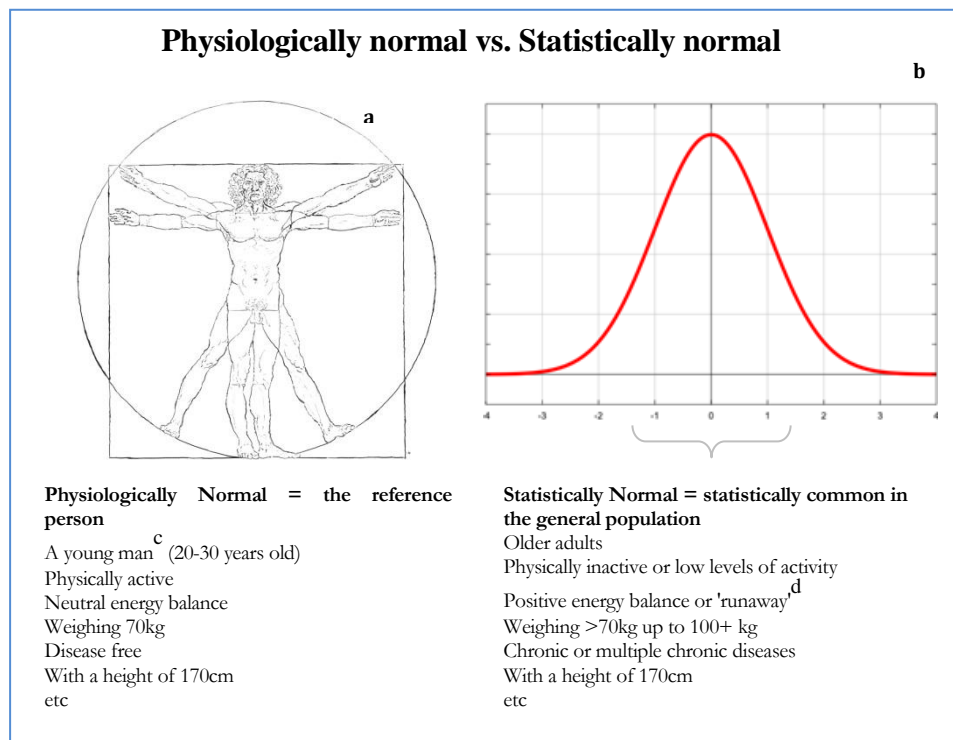


Figure 46: Biological vs. statistical normality

^a The Vitruvian Man by Leonardo da Vinci circa 1490, used here to symbolise physiological normality.

^b Stylised normal distribution curve symbolising the idea that physical inactivity is somewhat common in the general population.

^c By scientific convention only

^d A positive energy balance with a positive acceleration

Leonardo da Vinci's Vitruvian Man (circa 1490) is used here to symbolise a biologically and behaviourally normal person who is disease free, compared to a statistically normal or 'common' person (symbolised by the normal distribution curve) who fails to maintain homeostasis and who has chronic disease. The physiologically normal person can be described as a theoretical person who is biologically/behaviourally 'correct' and 'stable' on all parameters, for example lean tissue/fat ratio, nutritional intake, physical activity, and who is disease free. The statistically normal person can be described as a person whose biological/behavioural parameters are 'common' or 'average' (more common than not) within the population in which they live but not necessarily within the ranges that support efficient human function and health. In the case of physical activity, it is statistically normal for people who live in the West to be relatively physically inactive (for example working in a sedentary job and not participating in planned exercise). Estimations of physical activity suggest that only 5-50% of people meet the current physical activity recommendations. However, the human body requires comparatively high levels of daily physical activity to maintain proper functional capacity and to remain disease free (refer to the literature review section for more detail and references).

This study aimed to address this common misunderstanding by involving a counselling style, Motivational Interviewing in a programme that encouraged participants to examine their understanding of normal, and in

this regard, the difference between their *current* and their *ideal* self. The intervention also involved formalising a support-person relationship within the programme to attempt to broaden the reach of the programme and to propagate new understanding of what is normal via pre-existing social channels. Is it strongly argued here that the success of such a programme in a community setting would be dependent in large part on the programme being implemented by enthusiastic people, with common ideas and goals. It is stressed here that physical inactivity needs to be recognised as a serious threat to public health and that it needs to be taken considerably more seriously than is currently the case. Changes in people's perceptions and acceptance of exactly what 'normal' means can bring about significant and dramatic health benefits¹⁰⁹.

As broadly argued by (Fuchs, 1998; Fuchs, 2011) the importance that society and individuals place on an issue will reflect the resources allocated to that issue. Therefore, it is suggested here that the relevance of this distinction between physiologically-behaviourally normal and statistically normal is essentially one of resourcing. Compared to the domains of drug and alcohol treatment¹¹⁰, smoking cessation, diabetes care¹¹¹, and cancer

¹⁰⁹ For example, the influence of changing beliefs and the adoption of a new 'normal' has been dramatically demonstrated by the reduction in cerebrovascular disease rates in the US from the 1970s. The dramatic rate of decline in this period has been attributed not to a new drug or technology but to an updated understanding of normal (in this case the normal range for blood pressure for older patients) and hence what constituted good medical care (namely a shift to aggressive treatment of hypotension with existing diuretic medications) (Fuchs, 2011).

¹¹⁰ Including intensive individual and group treatment programmes, and the use of residential treatment facilities.

¹¹¹ Including extensively developed and refined self-management models of education and care.

research for example; the progress on developing effective physical activity promotion programmes is slow. With respect to treating physical inactivity, it is not known conclusively if a proactive chronic disease model is better than the present 'laissez-faire' model, that is, whether proactive care works better in the longer term, and more research *is* needed. Perhaps it is not *yet* seen as sufficiently important?

Given that all health interventions are to a greater or lesser degree resource-limited (generally by the process of prioritisation) then, as Venditti and Kramer (2012) conclude in their recent and comprehensive review of the behaviour-change literature, there is clearly a need to determine ways of extending intervention contact over longer periods of time (and potentially across social networks), with the clinical accountability and support that this affords. In the context of a physical activity counselling and support programme, this study demonstrated one way in which this might be achieved.

What is already known on this topic

Few studies have explored the effects of formally including a motivational-buddy within a Motivational Interviewing session for physical activity behaviour change.

Little is known about the factors that might influence or modify buddy-relationships (both intra-session and extra-session).

Most studies that have included support people have been smoking cessation trials and most have focused on training support people in their role. Much less is known about the merits or otherwise of matching support people to service the specific needs of the programme participant.

What this study adds

This study shows that buddy-Motivational Interviewing with email follow-up is feasible, effective and acceptable to participants and favourable collateral health effects may also be transferred to significant others.

Taken together with previous observations, these findings suggest that training buddies to be more supportive may encounter a ceiling effect and more research into the optimal matching of buddies and programme participants is needed.

Buddy-Motivational interviewing is an approach that could be incorporated into existing programmes or one that can potentially form the basis of future stand-alone-programmes in physical activity promotion and potentially in many other primary care contexts.

This study provides information and guidance on how this might be done.

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9 Appendix A

1. The Physical Activity Readiness Questionnaire (PAR-Q)
2. The Cooper 12 minute run test
3. Exit survey questions
4. Helpful Response Questionnaire

9.1 The Physical Activity Readiness Questionnaire

Physical Activity Readiness
Questionnaire - PAR-Q
(revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
<input type="checkbox"/>	<input type="checkbox"/>	1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
<input type="checkbox"/>	<input type="checkbox"/>	2. Do you feel pain in your chest when you do physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	3. In the past month, have you had chest pain when you were not doing physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
<input type="checkbox"/>	<input type="checkbox"/>	5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
<input type="checkbox"/>	<input type="checkbox"/>	7. Do you know of any other reason why you should not do physical activity?

If
you
answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active — begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal — this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever — wait until you feel better; or
- if you are or may be pregnant — talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____

DATE _____

SIGNATURE OF PARENT
or GUARDIAN (for participants under the age of majority) _____

WITNESS _____

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

9.2 Cooper 12min fitness test

Objective: To monitor the development of the participant's aerobic endurance and to obtain an estimate of their VO₂max.

Required Resources

- 400 metre track – (optional: marked every 100 metres or estimated as 'part laps') (Figure 13) or a treadmill.
- Stop watch (or time/distance display on a treadmill)
- Assistant (optional)

How to conduct the test

- The participant conducts a 10 to 15 minute warm up at low intensity (easy pace jog or walk).
- Using the track (or treadmill), the participant runs/walks as far as possible in 12 minutes (best performance).
- The participant or assistant records the total distance covered to the nearest 100 metres (or estimated 'part lap').
- The participant conducts a cool down.

Note: The following factors may have an impact on the results of a test and the participant should attempt to standardise as many of these factors as possible for each test.

- The ambient temperature and humidity
- The amount of sleep the participant had prior to testing
- The participant's emotional state
- Medication the participant may be taking
- The time of day
- The participant's caffeine intake
- The time since the participant's last meal
- The test environment - surface (track, grass, road, gym)
- Accuracy of measurements (times, distances etc.)
- The warm up
- People present

These factors will not be specifically measured but participants were instructed to 'routinise' the procedure to help minimise variability. There may be a 'learning effect' on the first attempt, but the 12 month and 18 month tests should be relatively standardised. Between-group comparisons should be valid.

Analysis

Analysis of the result is by comparing the distance walked/run with the results of previous tests. It is expected that, with appropriate training between each test, the analysis would indicate an improvement. An estimate of participants' VO₂max (ml/kg/min) can also be calculated as follows: (Distance covered in metres - 504.9) ÷ 44.73. Cooper (1968) reported a correlation of 0.90 between VO₂max and the distance covered in a 12 min walk/run (men only).

Subsequent studies have validated the test for women also with correlations of between 0.54 – 0.91. Participants' scores can also be compared to published VO2max tables and Participants' can be grouped into six fitness categories as defined by the Cooper Institute: Very Poor, Poor, Fair, Good, Excellent, Superior - based on the Cooper Institute's normative data stratified by age and gender Table 36 and Table 37.

Table 36 Normative data for VO2max, Female (values in ml/kg/min)

Age	Very Poor	Poor	Fair	Good	Excellent	Superior
13-19	<25.0	25.0 - 30.9	31.0 - 34.9	35.0 - 38.9	39.0 - 41.9	>41.9
20-29	<23.6	23.6 - 28.9	29.0 - 32.9	33.0 - 36.9	37.0 - 41.0	>41.0
30-39	<22.8	22.8 - 26.9	27.0 - 31.4	31.5 - 35.6	35.7 - 40.0	>40.0
40-49	<21.0	21.0 - 24.4	24.5 - 28.9	29.0 - 32.8	32.9 - 36.9	>36.9
50-59	<20.2	20.2 - 22.7	22.8 - 26.9	27.0 - 31.4	31.5 - 35.7	>35.7
60+	<17.5	17.5 - 20.1	20.2 - 24.4	24.5 - 30.2	30.3 - 31.4	>31.4

Table 37 Normative data for VO2max, Male (values in ml/kg/min)

Age	Very Poor	Poor	Fair	Good	Excellent	Superior
13-19	<35.0	35.0 - 38.3	38.4 - 45.1	45.2 - 50.9	51.0 - 55.9	>55.9
20-29	<33.0	33.0 - 36.4	36.5 - 42.4	42.5 - 46.4	46.5 - 52.4	>52.4
30-39	<31.5	31.5 - 35.4	35.5 - 40.9	41.0 - 44.9	45.0 - 49.4	>49.4
40-49	<30.2	30.2 - 33.5	33.6 - 38.9	39.0 - 43.7	43.8 - 48.0	>48.0
50-59	<26.1	26.1 - 30.9	31.0 - 35.7	35.8 - 40.9	41.0 - 45.3	>45.3
60+	<20.5	20.5 - 26.0	26.1 - 32.2	32.3 - 36.4	36.5 - 44.2	>44.2

Table 38 Normative data for VO2max, Male (values in ml/kg/min)

Table Reference: The Physical Fitness Specialist Certification Manual, The Cooper Institute for Aerobics Research, Dallas TX, revised 1997.

Related Research Paper: Cooper, KH. "A means of assessing maximal oxygen intake". JAMA. 203:201-204, 1968

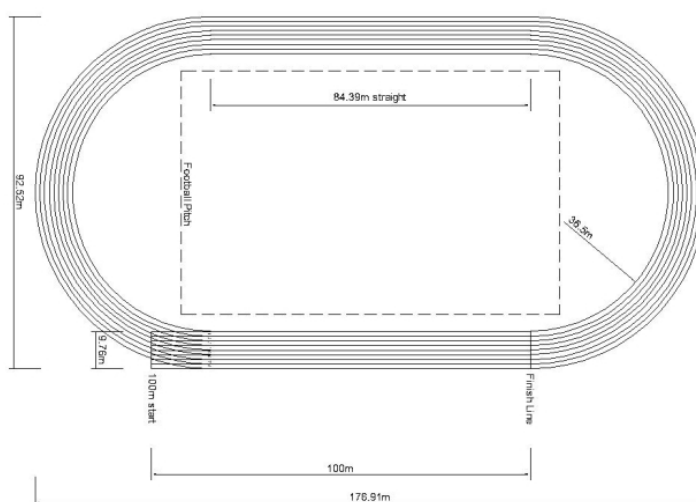


Figure 47 Typical 400m track layout

Exit survey questions

Table 39: Exit survey questions

1	What changes (if any) did you make in your day-to-day life as a result of the programme?
2	What did you learn during this program that you can use in the future?
3	Over the last 12-months, how much have you increased and maintained your overall levels of leisure-time and/or transport-related physical activity? -Not at all -A little -Moderately -Quite a bit -A great deal
4	Please select the amount of time in a typical week that your motivational-buddy provided you with support (in any form). -Less than 15min per week -15-30min per week -30-60min per week -1-2 hours per week -More than 2 hours per week -More than 5hours per week
5	Please select any number of items from the list below that describe the nature of the support provided by your motivational-buddy. What types of things did your motivational-buddy do? -Brainstorming/sharing ideas -Coffee catch-ups -Collaborative goal setting/goal sharing -Competition (e.g. entering an event or competition together) -Contracts (verbal, written ... establishing accountability) -Doing regular scheduled exercise together -Email prompts -Exercise-log sharing (tracking progress) -Facebook -Hand written notes in the post -Help with planning set actions to deal with possible future challenges -Listening -Phone calls -Taking an interest -Taking holidays/ trips away involving physical activity -Text prompts -Walk & Talk -Other
6	Finally, we are interested in the 'style' of support and motivation your buddy provided as well as some characteristics your buddy might have demonstrated. Please select as many characteristics as applicable from the list below to complete the following statement: On the whole, my motivational-buddy was... -collaborative -committed to helping me -compassionate -confident I could change -confrontational -contemptuous -critical -dependable -directive -discouraging -disinterested -doubtful I could change -encouraging me to be accountable

- engaged
- enthusiastic
- genuinely concerned
- guiding
- hostile
- indifferent to my progress
- interested in my progress
- invested in my goals
- knowledgeable
- pleased I was making an effort
- positive
- supportive
- unconcerned
- unsupportive
- warm
- Other

- 7 Optional: Please make any further comments you like on any aspect of your experience with the programme? Please mention if any significant life-event influenced your participation in the programme and if so how.
-

9.3 *Helpful Response Questionnaire*

The Helpful Responses Questionnaire (HRQ; Miller, Hedrick, & Orlofsky, 1991) is an open-response assessment that is used to measure accurate empathy, a key component in MI. This assessment was used to measure pre and post-training outcomes in several MI training studies (Miller et al., 2004; Miller & Mount, 2001). This six-item questionnaire consists of summaries that communicate the specific concerns of individuals. Test-takers were asked to provide a written response in the space provided below the individual's concern. The HRQ takes approximately 15 minutes to administer and is scored on a 5 point Likert scale of depth reflection. Truax's depth rating system and concepts from Gordon's (1970) roadblocks to communication (**Table 40**) are used to score this measure. A score of one, which is considered the lowest score in regard to an empathetic answer, is given if the response does not contain a reflection and does have one or more of Gordon's (1970) roadblocks to communication (some of which include: directing, threatening, making suggestions or providing solutions, lecturing, preaching, judging or disagreeing, agreeing, approving, or praising, labelling, interpreting or analysing, sympathizing or consoling, questioning or probing, distracting, humouring, or changing the subject) in the written reply. Conversely, a score of five is given if the response is an accurate paraphrase, contains an element of meaning that is inferred by the statement, and either contains an accurate reflection of feeling, metaphor or simile. The assessment provides a reasonable measure of the expression of empathy.

Instructions (from Miller et al., 1991)

The following six paragraphs are things a person might say to you. With each paragraph, imagine that someone you know is talking to you and explaining a problem that he or she is having. You want to help by saying the right thing. Think about each paragraph as if you were really in the situation, with that person talking to you. In each case write the next thing that you might say if you wanted to be helpful. Write only one or two sentences for each situation. Please print or write clearly.

A 41-year-old woman says:

"Last night Joe really got high and he came home late and we had a big fight. He yelled at me and I yelled back and then he hit me really hard! He broke a window and the TV set, too! It was like he was crazy. I just don't know what to do!"

The next thing that you might say if you wanted to be helpful is:

A 36-year-old man says:

"My neighbor really makes me mad. He's always over here bothering us or borrowing things that he never returns. Sometimes he calls us late at night after we've gone to bed and I really feel like telling him to get lost."

The next thing that you might say if you wanted to be helpful is:

A 15-year-old girl says:

"I'm really mixed up. A lot of my friends, they stay out real late and do things their parents don't know about. They always want me to come along and I don't want them to think I'm weird or something, but I don't know what would happen if I went along either."

The next thing that you might say if you wanted to be helpful is:

A 35-year-old parent says:

"My Maria is a good girl. She's never been in trouble, but I worry about her. Lately, she wants to stay out later and later and sometimes I don't know where she is. She just had her ears pierced without

asking me! And some of the friends she brings home—well, I've told her again and again to stay away from that kind. They're no good for her, but she won't listen."
The next thing that you might say if you wanted to be helpful is:

A 43-year-old man says:

"I really feel awful. Last night I got drunk and I don't even remember what I did. This morning I found out that the screen of the television is busted and I think I probably did it, but my wife isn't even talking to me. I don't think I'm an alcoholic, you know, 'cause I can go for weeks without drinking. But this has got to change."
The next thing that you might say if you wanted to be helpful is:

A 59-year-old unemployed teacher says:

"My life just doesn't seem worth living anymore. I'm a lousy father. I can't get a job. Nothing good ever happens to me. Everything I try to do turns rotten. Sometimes I wonder whether it's worth it."
The next thing that you might say if you wanted to be helpful is:

Table 40: Helpful Responses Questionnaire scoring guide

Score	Definition
1	The response contains no reflection, but does include at least one element scorable as a "roadblock" response as defined in Gordon's (1970) "typical twelve" responses (categories A-E below).
2	The response contains both a reflection (scorable at level 3, 4, or 5 below) and a roadblock, or contains neither reflection nor roadblock response.
3	A response that is a reflection or contains a reflection that merely repeats the content already stated.
4	When the reflection reaches paraphrase status, adding inferred meaning that appears appropriate or plausible.
5	When the response qualifies at level 4 and also includes either a reflection of feeling that fits the original statement or an appropriate metaphor or simile.

"Roadblocks" as defined in Gordon's "typical twelve" responses

A. Typical responses that communicate UNACCEPTANCE are:

1. Ordering, commanding, directing. (Words phrased in an authoritarian way). e.g. "Don't say that!"
2. Warning, cautioning or threatening. Carries the threat of impending negative consequences if the advice or direction is not followed. e.g. "If you don't start"
3. Moralizing, preaching, and giving "shoulds" and "oughts". An underlying moral code or instruction in proper conduct. e.g. "You should ..."
4. Advising, offering solutions or suggestions. Recommending an action based on experience and/or knowledge. e.g. "Have you tried ..."
5. Teaching, lecturing, giving logical arguments. Assumes the person has not adequately considered the facts. e.g. "Yes, but ..."

B. Typical responses that tend to communicate INADEQUACIES and FAULTS:

6. Judging, criticizing, disagreeing, blaming. Implying that there is something wrong with the person or his/her actions. e.g. "It's your fault that ..."
7. Name-calling, stereotyping, labelling. Overt disapproval directed at the person. e.g. "How could you do such a thing?"
8. Interpreting, analyzing, diagnosing. To seek out or propose a meaning or diagnosis. e.g. "Do you know what your real problem is?"

C. Some responses try to make the person feel better by DENYING there is a problem:

9. Praising, agreeing, giving positive evaluations. Gives a sanction or approval that may imply a difference in power. e.g. "That's what I would do".
10. Reassuring, sympathizing, consoling, supporting. Intended to 'help' the person feel better. e.g. "I'm sure things will work out OK in the end".

D. This response tends to try to SOLVE the PROBLEM for the person:

11. Questioning, probing, interrogating, and cross-examining. The implication is that with enough

questions, the 'expert' will be able to find the answer. e.g. "What makes you feel that way?"

E. These messages tend to divert the person or **AVOID** the person altogether:

12. Withdrawing, distracting, being sarcastic, humouring, diverting. Diverts the communication away from the topic. e.g. "Let's come back to that another time".

Adapted from: Gordon (1970) and Miller et al. (1991) and Miller (2000).

For more information on scoring see Miller et al. (1991) "The Helpful Responses Questionnaire: a procedure for measuring therapeutic empathy".

10 Appendix B

1. Ethics approval: UC
2. Ethics approval: CPIT
3. Confidentiality agreement: research assistant

10.1 Ethics approval UC

Ref: HEC 2010/166

6 December 2010

David Brinson
Health Sciences Centre
UNIVERSITY OF CANTERBURY

Dear David

The Human Ethics Committee advises that your research proposal “A dyadic model of Motivational Interviewing (DI) for physical activity behaviour change consultations in primary care and community settings: a pragmatic randomised controlled trial” has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 30 November 2010. Further, we will approve the short training exercise as a pilot study as part of the approved application.

Best wishes for your project.

Yours sincerely

Dr Michael Grimshaw
Chair, Human Ethics Committee

10.2 Ethics approval CPIT

Research and Knowledge Transfer Committee, Ethics Subcommittee

Telephone: +64-3-940 8483
Facsimile: +64-3-940 8019
Email: rea.daellenbach@cpit.ac.nz



9 May, 2012

David Brinson
Health Sciences Centre
University of Canterbury
Private Bag 4800
Christchurch 8020

Dear David

RE: A dyadic model of motivational interviewing for physical activity change consultations in primary care and community settings: a pragmatic randomised controlled trial

Thank you for your application to the CPIT RKTC Ethics Subcommittee. On the 30 April, the Ethics Subcommittee reviewed your proposal and has given approval for you to recruit participants for this research at CPIT.

If you have any questions, please contact me.

Best wishes for this project.

Yours sincerely,

A handwritten signature in blue ink that reads 'Rea Daellenbach'.

Rea Daellenbach
Chair RKTC Ethics Subcommittee
rea.daellenbach@cpit.ac.nz

10.3 Confidentiality agreement: research assistant

Note: not used as no assistant was assigned.



David Brinson

Health Sciences Department

Mailing Address: University of Canterbury | Private Bag 4800 | Christchurch 8140 | New Zealand

Location: Waimairi Building | Dovedale Avenue | Ilam | Christchurch

Email: david.brinson@canterbury.ac.nz

Date:

CONFIDENTIALITY AGREEMENT: Research assistant

Agreement concerning confidentiality, data access, and sharing.

Research project: A dyadic model of Motivational Interviewing (dMI) for physical activity behaviour change consultations in primary care and community settings: a pragmatic randomised controlled trial.

To be completed by the principal researcher, the research assistant and senior supervisor prior to the commencement of the research assistant's involvement in the project.

Agreement between David Brinson (principal researcher)
and

_____ (Research assistant)

_____ (Supervisor)

We confirm we have read and have discussed the relevant University and Department Policies and Guidelines: "Human Ethics Committee (HEC): Principles and Guidelines" (in particular section 6.2 Privacy and Confidentiality, I-V).

In accordance with the Department and University Policies and Guidelines in respect to these matters we have reached agreement using this template –

We agree

Data Access

- That only the project supervisor(s) and the principal researcher (and the research assistant in the case of anonymised data) will have access to the raw and processed data during the research and following the completion of the thesis.
- That confidentiality of the information provided by participants will be ensured, and that all reasonable steps will be taken to see that it cannot be known by unauthorised persons.
- The research assistant will not have access to any video recordings.
- That the Human Ethics Committee (HEC): Principles and Guidelines section 6.2 Privacy and Confidentiality, I-V will be adhered to.

Data Storage

We agree that the data will be stored as described below:

- Data will be stored on the principal researcher's password protected personal computer within his locked office. Documents will be stored within the principal researcher's locked filing cabinet within his locked office.
- The research assistant will maintain a database of participants' names and contact details for the purpose of scheduling appointments and for follow-up purposes (stored on the research assistant's password protected personal computer).
- The research assistant will also have access to other anonymised data (protected by a participant code number sequence) for the purposes of data entry and data-base management but such data will not be 'linkable' to participants' personal details.
- Data will be kept securely for 7years by the University of Canterbury. At the end of the seven year period, the data will be destroyed.

Variations

- This agreement may not be amended without the signed and dated agreement of the parties to it and approval from the University of Canterbury's Human Ethics Committee (HEC).

Signatures

Senior Supervisor	Date
Principal researcher	Date
Research assistant	Date

11 Appendix C

1. Recruitment email
2. Recruitment flyer
3. Participant information sheet
4. Buddy information sheet
5. Informed consent: participant
6. Informed consent: buddy
7. Buddy basics: instructional booklet
8. Buddy-basics DVD cover art
9. Training guidelines for interventionists booklet

11.1 Recruitment letter/email



You are invited to participate in a PhD research project about physical activity.

Are you interested in increasing your fitness and improving your health?

Are you currently relatively sedentary in your lifestyle?

Are you interested in increasing your physical activity, perhaps taking up a sport ... trying something new?

If you answered yes to the above questions ... please read on

The aim of the programme is to help you develop your motivation and commitment to physical activity

What's in it for you?

If you participate in the study you will receive 12 months (as you need it) of personalised one-on-one physical activity focused behaviour change consultation free of charge ... using Motivational Interviewing.

Interested?

If you are interested in participating, then please read the information sheet (attached to this email) and you can reply to this email for further information or to register your interest.

Kind regards

David Brinson BSpC, MHealSc

Health Sciences Department


Mailing Address: University of Canterbury | Private Bag 4800 | Christchurch 8140 | New Zealand

Location: Waimairi Building | Dovedale Avenue | Ilam | Christchurch

Email: david.brinson@canterbury.ac.nz

11.2 Recruitment flyer

Do you want to increase your physical activity? ... your fitness?



U Do it CAN

The aim of the programme is to help you develop your motivation and commitment to physical activity

Volunteers sought for PhD research study

What's in it for you?

If you participate in this programme you will receive between two and four consultations involving Motivational Interviewing: aimed at strengthening your motivation for change*. The benefit to you is that you will receive real help with your motivation, and it's **free**! Topics for discussion could include the benefits of physical activity, identifying barriers and enablers, problem solving skills, action planning.... or anything at all that could help you to become more active.

Not only that ... you can learn skills that you can transfer to other areas of your life and to other types of situations (e.g. nutrition, weight loss, smoking cessation, decision-making). You can make real gains that can endure over a lifespan... all for a modest input of time and effort.

The project is being carried out in fulfilment of the requirements for a Doctorate of Philosophy (PhD) in Health Sciences by David Brinson under the supervision of Associate Professor Ray Kirk (senior supervisor), Professor Andrew Hornblow (co-supervisor) and Dr Mark Wallace-Bell (associate supervisor) who can be contacted at the University of Canterbury, Ph. +64 3 366 7001.

The project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

***Note this is not an 'exercise class'**

david.brinson@canterbury.ac.nz

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Please contact David Brinson for more details
E david.brinson@canterbury.ac.nz
W www.hsci.canterbury.ac.nz/people/brinson.shtml
/text



UC

UNIVERSITY OF CANTERBURY

Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

2012

Page 432 of 572

11.3 Participant Information Sheet



You are invited to participate in a physical activity motivation project¹¹²

The main aim of the study is to test two similar programmes involving Motivational Interviewing¹¹³, the focus being to assist you to adopt regular physical exercise for the purpose of improving your cardio-respiratory fitness, health, and health-related quality of life. The programme specifically aims to help you develop your motivation and commitment to physical activity.

What's in it for you?

If you enrol in this study you will be randomly allocated to participate in one of two slightly different programmes, let's call them Group A and Group B. If you are randomly assigned to Group A, then you will receive 12 months of personalised one-on-one physical activity focused behaviour change support free of charge ... involving sessions of Motivational Interviewing (a minimum of two sessions but no more than four sessions of 20-50min each). The focus of the Motivational Interviewing sessions will be to help you adopt and/or become more engaged in regular physical activity. These sessions will be video-taped and some recordings may be randomly selected by the study supervisor for review, and checked against defined quality criteria (i.e., checking that the programme is being delivered as it is intended). All video recordings will remain absolutely secure and confidential and your video-recordings will not be presented in any form of individually recognisable results. You will be asked to complete a questionnaire about physical activity and quality of life and also to complete a simple 12min self-administered fitness test at three different times during the 12-month study period. These assessments of your progress should take you no more than an hour to complete in total at each follow-up interval. The first assessment would occur at the start of the programme, then one month later and then again at three months. As a follow-up to this investigation, you will be asked to complete a minimal assessment again 12 months after your first session.

If you happen to be assigned to Group B, everything will be exactly as outlined above for group A except for the fact that you will be asked to bring along a support person (e.g. spouse/partner, friend, brother, sister) to the Motivational Interviewing sessions. Your support person or buddy will be given some tips and guidance on how to be effective in helping you become

¹¹² Full working title: A dyadic model of Motivational Interviewing (dMI) for physical activity behaviour change consultations in primary care and community settings: a pragmatic randomised controlled trial.

¹¹³ Motivational interviewing is a collaborative, person-centred form of guiding to elicit and strengthen motivation for change.

more engaged in regular physical activity (Note that the support person doesn't necessarily have to be physically active at all).

After the study you will receive a written report of your scores on the various measures and an indication of your progress over the period of your enrolment in the study and a summary of key study findings. No specific risks are foreseen relating to your participation in the study, however participation may prompt you to reflect on and evaluate your current health status and lifestyle choices. You will have the right to withdraw from the project at any time, including withdrawal of any information provided. Note that you do not necessarily need to be continually enrolled/staff at the University of Canterbury for the duration of the study, as long as you intend to be living in Christchurch (or are available to visit Christchurch) during the study period as needed.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public at any time as all data will be presented as averages of the groups' scores.

The project is being carried out in fulfilment of the requirements for a Doctorate of Philosophy (PhD) in Health Sciences by David Brinson under the supervision of Associate Professor Ray Kirk (senior supervisor), Professor Andrew Hornblow (co-supervisor) and Dr Mark Wallace-Bell (associate supervisor) who can be contacted at the University of Canterbury, Ph. +64 3 366 7001 (Switchboard). They will be pleased to discuss any concerns you may have about participation in the project. The project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

If you have any questions at all, please don't hesitate to contact me.

Yours Truly



David Brinson BSpC, MHealSc

☎ 027 xxx xxxx

Email: david.brinson@canterbury.ac.nz

Mailing Address: University of Canterbury | Private Bag 4800 | Christchurch
8140 | New Zealand | Location | Room 108 Waimairi Building | Dovedale
Avenue | Ilam | Christchurch

11.4 Motivational-buddy Information Sheet



You are invited to participate as a support person or *motivational-buddy* in this physical activity motivation project¹¹⁴

The main aim of the study is to test two similar programmes involving Motivational Interviewing¹¹⁵, the focus being to assist people to adopt regular physical exercise for the purpose of improving fitness, health, and health-related quality of life. The programme specifically aims to help people develop their motivation and commitment to physical activity.

What's in it for you?

It is hoped that the experience of being involved in the study as a support person will be interesting, enjoyable, and rewarding. If you agree to be involved, you will be provided with information and instruction in specific communication skills and motivational techniques (including an instructional booklet *Buddy-basics* and an accompanying instructional DVD). These skills will be helpful in your interactions with the person you have agreed to support (they may also help you in different areas of your daily life). The buddy partnership may overlap into different areas of life and that is totally up to you. Overall, you will be given some tips, guidance and practice in how to be effective in helping the person you are supporting become more engaged in regular physical activity. Note that you, as the support person, do not necessarily have to be physically active at all.

What will you be asked to do?

Generally, you will be asked to provide support to the other person within your buddy partnership. One key thing you will be asked to do is to attend sessions of Motivational Interviewing as a support person (a minimum of two sessions but no more than four sessions of 20-50min each). The person you are supporting will receive 12-months of personalised one-on-one physical activity focused behaviour change support free of charge and you will be asked to attend these sessions and offer any support and input that you can. These sessions will be held in 'The clinic' in the Health Sciences Centre, University of Canterbury, Waimairi Building, Dovedale Avenue campus.

¹¹⁴ Full working title: A dyadic model of Motivational Interviewing (dMI) for physical activity behaviour change consultations in primary care and community settings: a pragmatic randomised controlled trial.

¹¹⁵ Motivational interviewing is a collaborative, person-centred form of guiding to elicit and strengthen motivation for change.

These sessions will be video-taped for the purpose of ensuring the quality of the programme (i.e., that the programme is being delivered as it is intended). All video recordings will remain absolutely secure and confidential and your video-recordings will not be presented in any form of individually recognisable results.

After the study you will receive a written summary of the key research findings. No specific risks are foreseen relating to your participation in the study as a support buddy, however participation may prompt you to reflect on and evaluate your current health status and your own lifestyle choices. You will have the right to withdraw from the project at any time. The results of the project may be published, but you may be assured of complete confidentiality. Your identity or any personally identifiable information will not be made public at any time.

The project is being carried out in fulfilment of the requirements for a Doctorate of Philosophy (PhD) in Health Sciences by David Brinson under the supervision of Associate Professor Ray Kirk (senior supervisor), Professor Andrew Hornblow (co-supervisor) and Dr Mark Wallace-Bell (associate supervisor) who can be contacted at the University of Canterbury, Ph. +64 3 366 7001 (Switchboard). They will be pleased to discuss any concerns you may have about participation in the project. The project has been reviewed and approved by the University of Canterbury Human Ethics Committee.

If you have any questions at all, please don't hesitate to contact me.

Yours Truly



David Brinson BSpC, MHealSc

☎ 027 xxx xxxx

Email: david.brinson@canterbury.ac.nz Mailing Address: University of Canterbury | Private Bag 4800 | Christchurch 8140 | New Zealand Location | Room 108 Waimairi Building | Dovedale Avenue | Ilam | Christchurch

11.5 Consent form: Participant



David Brinson

☎ 027 xxx xxx

Email: david.brinson@canterbury.ac.nz

Mailing Address: University of Canterbury | Private Bag 4800 | Christchurch
8140 | New ZealandLocation| Room 108 Waimairi Building | Dovedale
Avenue | Ilam | Christchurch

Date:

CONSENT FORM: Participant

Please confirm

- I have read and understand the information sheet (dated: 27 February 2014) for the above research study.
- I have had the opportunity to ask questions about the research study, and to discuss it with Whānau/ family and friends and have had time to consider whether or not to take part.
- I understand the purpose of the research study and how I will be involved. In particular, I understand that I will participate in motivational interviews, and that these motivational interviewing sessions will take place in 'The clinic' in the Health Sciences Centre, University of Canterbury, Waimairi Building, Dovedale Avenue campus, and that these sessions will be video-taped. I understand that some of my recordings may be randomly selected by the study supervisor for review, and that they will be checked against defined quality criteria, to ensure that the motivational interviewing sessions take place in a way that matches the collaborative and supportive style of the programme. I understand that I will receive a DVD copy of all-or-any of my recordings upon request and that all video recordings will remain absolutely secure and confidential and that my video-recordings will not be presented in any form of individually recognisable results.
- I understand, and accept, that my participation in the study may prompt me to reflect on and evaluate my current health status and lifestyle choices.
- I understand that all information collected in the research study will be held in confidence and that, if it is presented or published, all my personal details will be removed (I understand that I will receive a confidential, personalised summary of my own results and a summary of the overall study findings).

- I give permission for the study supervisors to have access to my questionnaire notes where it is relevant to my taking part in the research (on the understanding that no personal details will be presented or published without my permission).
- I confirm that I will be taking part in this research study of my own free will, and I understand that I may withdraw from it, at any time and for any reason (including withdrawal of any information I have provided).
- I know who to contact if I have any questions whatsoever about my participation in the study.
- I have read and understood the description of the above-named project. On this basis I agree to participate in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.
- I note that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee. Research project: A dyadic model of Motivational Interviewing (dMI) for physical activity behaviour change consultations in primary care and community settings: a pragmatic randomised controlled trial.

NAME (please print): Date:
 Signature:

... for our records

Your preferred email address
Mobile phone number

Note: these details may be used to assist us with follow-up over the length of the study if necessary but will not be shared with any third party.

11.6 Consent form: Buddy



David Brinson

☎ 027 281 4997

Email: david.brinson@canterbury.ac.nz

Mailing Address: University of Canterbury | Private Bag 4800 | Christchurch
8140 | New ZealandLocation| Room 108 Waimairi Building | Dovedale
Avenue | Ilam | Christchurch

Date: 27 February 2014

CONSENT FORM: Buddy

Please confirm

- I have read and understand the information sheet (dated: 27 February 2014) for the above research study.
- I have had the opportunity to ask questions about the research study, and to discuss it with Whānau/ family and friends and have had time to consider whether or not to take part.
- I understand the purpose of the research study and how I will be involved.
- I understand, and accept, that I am not formally enrolled in the study and I am participating in the study as a support person only. However, I understand that within my support role, I will attend and to a greater or lesser degree participate in motivational interviewing sessions with the person I am supporting.
- I understand that these motivational interviewing sessions will take place in 'The clinic' in the Health Sciences Centre, University of Canterbury, Waimairi Building, Dovedale Avenue campus and that these sessions will be video-taped. I understand that some recordings (in which I might appear) may be randomly selected by the study supervisor for review, and that they will be checked against defined quality criteria, to ensure that the motivational interviewing sessions take place in a way that matches the collaborative and supportive style of the programme. I understand that all video recordings will remain absolutely secure and confidential and that my video-recordings will not be presented in any form of individually recognisable results.
- I understand that all information collected in the research study will be held in confidence and that, if it is presented or published, all my personal details will be removed.
- I confirm that I will be taking part in this research study of my own free will, and I understand that I may withdraw from it, at any time and for any reason.

- I understand that I will be sent a copy of the overall study results after the study is completed.
- I know who to contact if I have any questions whatsoever about my participation in the study.
- I have read and understood the description of the above-named project. On this basis I agree to participate in the project, and that anonymity will be preserved.
- I note that the project has been reviewed and approved by the University of Canterbury Human Ethics Committee. Research project: A dyadic model of Motivational Interviewing (dMI) for physical activity behaviour change consultations in primary care and community settings: a pragmatic randomised controlled trial.

NAME (please print): Date:

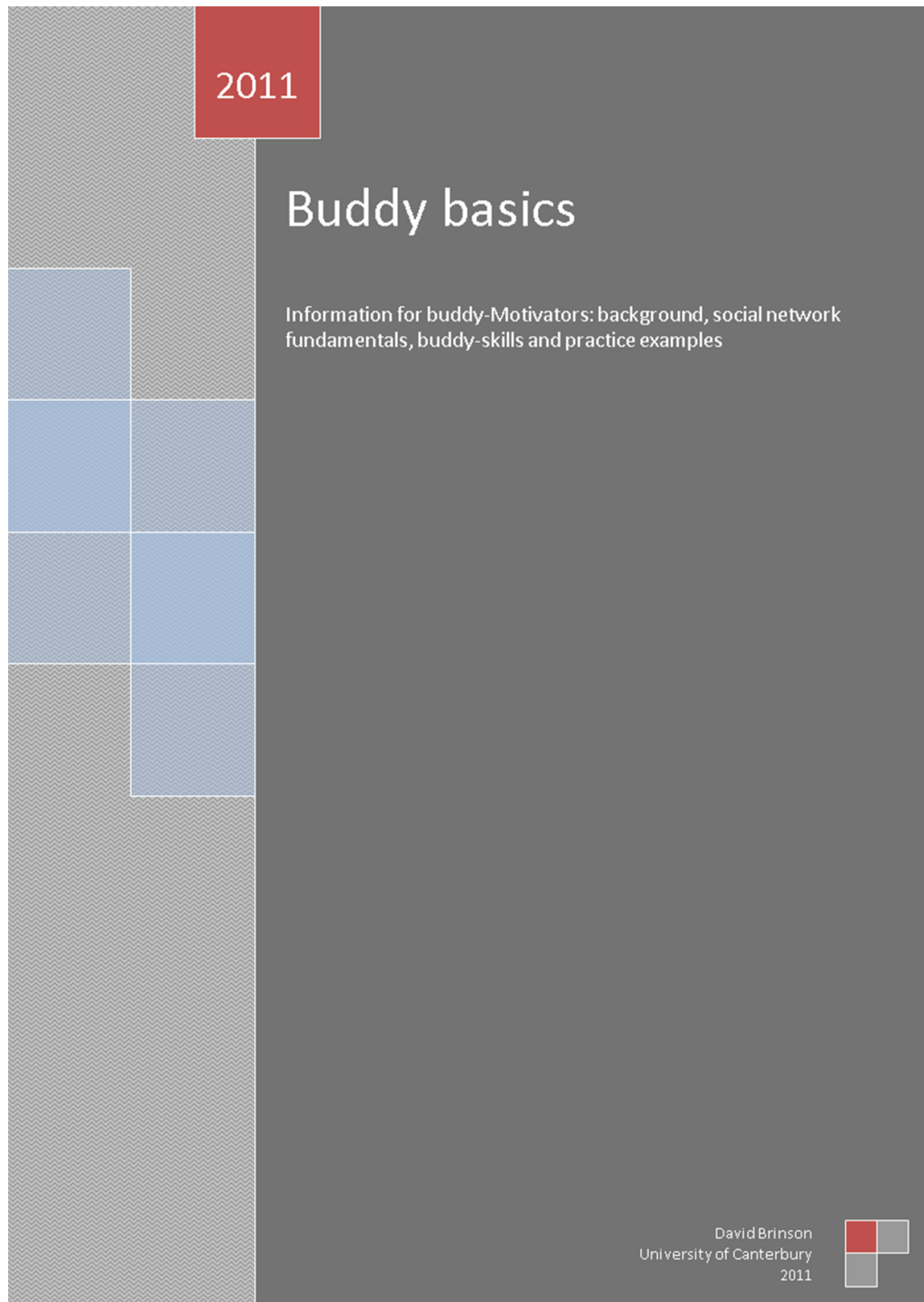
Signature:

... for our records

Your preferred email address
Mobile phone number

Note: these details will only be used to assist us with follow-up over the length of the study if necessary and will not be shared with any third party.

11.7 Buddy basics instructional booklet



Contents

Introduction ... a note from the researcher

Background

How do social networks influence our health?

As a 'buddy' you have influence ... how can you be most effective?

Motivational Interviewing

What can you do?

Different types of discussions and language, their level of helpfulness, and examples

More suggestions, ideas and tips for brainstorming

Introduction ... *a note from the researcher*

Thank you for agreeing to take part as a support person or 'buddy' in this study of behaviour change. Social support has been identified as a key factor associated with a variety of health behaviours and behaviour change in general. It is of considerable interest to establish whether social support can be harnessed in health-care interventions generally, and focusing on the buddy system is a practical way of testing this idea. Buddy systems have been used to support behaviour change in areas such as weight loss, alcohol misuse and smoking cessation, and the experimental research evidence is slowly building. Typically, the buddy will be given special responsibility to support the person (called 'the participant') attempting to change. The purpose of this self-directed-learning package is to provide you with information that may help you to be more effective in your 'buddy role'. Of course, much of this material may seem like 'common sense' but the finer points are worth considering ... and there are examples provided to help put the ideas into practice.

Background

Researchers have looked at social support to try to understand how social support influences health behaviours. Generally, social support (social integration) can be thought of in terms of structure and function. Structural support is the existence (and number) of family/friends and other social ties within an individual's environment—in other words a person's social network. Functional support on the other hand deals with the quality of those relationships and covers such things as compassion and understanding (emotional support or 'just being there'), and practical assistance ('doing things'). Throughout the 1970s and 1980s a series of studies appeared consistently showing that having close friends and relatives, being married, being involved in voluntary associations, and generally being part of a social network are all related to better health outcomes.

How do social networks influence our health?

People are connected, and so their health is connected¹¹⁶. Being part of a social network gives rise to opportunities for social participation and engagement. Getting together with friends, attending social functions, participating in sports and other group recreation are all examples of social engagement: which in turn provides a sense of value, belonging, and attachment (connectedness). Social support may also influence emotion, mood, self-esteem and perceived well-being. Also, the closeness of friendships seems to be relevant in that persons in closer, mutual, same-sex friendships have more of an effect on each other than persons in other types of friendships. Further, the more often friends have contact, the greater the number and types of interactions, the longer friends have known each other and the extent to which exchanges are even, fair and reciprocal, then the

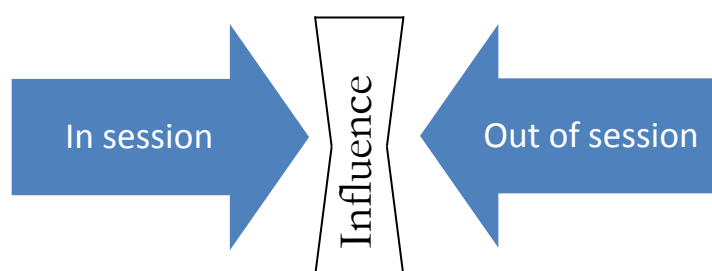
¹¹⁶ Christakis (2007).

greater the strength of the influence. In general, it is likely that people are influenced more by those they resemble than by those they do not¹¹⁷.

As a ‘buddy’ you have influence ... how can you be most effective?

In this programme, the buddy role can be thought of as exerting influence in two separate but related domains as shown in **Figure 1**. Firstly, the ‘in session’ domain that forms the structured Motivational Interviewing part of this physical activity promotion programme, and secondly, the ‘out of session’ domain which comprises all other buddy-to-participant¹¹⁸ interactions in day-to-day life.

Social support is a key ingredient in this programme (both in and out of session) and social support can be divided into emotional support (being there) and practical support (doing things, including providing feedback and advice). Emotional support includes the caring, sympathy, understanding, esteem or valuing that is available from others. Practical support refers to help with tangible needs: such as being an exercise partner at the gym or a running partner, or providing child care or other inputs of time and effort or other material resources. A buddy can provide support in some or all of these ways to help another with their health behaviour change.



The Motivational Interviewing part

The Social Support part

Figure 1: Fields of ‘buddy-influence’

Motivational Interviewing

The goal of involving a buddy in the Motivational Interviewing¹¹⁹ sessions is to directly engage the buddy in a support role to exert a positive influence on the change process, both within the sessions and outside the sessions (for example, during everyday life activities, providing on-going support, feedback and reinforcement, and assisting with problem solving). In Motivational

¹¹⁷ Bandura (1977).

¹¹⁸In this study, the ‘participant’ is the person enrolled in the physical activity programme and the ‘buddy’ is the support person.

¹¹⁹ The information presented here about Motivational Interviewing is drawn from the following publications: Miller & Rollnick (2002); Moyers, et al. (2007); Rollnick, Miller, & Butler (2008); Magill, et al. (2010).

Interviewing, we assume that the person already has at least some of the answers they need: the buddy's job is to assist in bringing these answers out. It is normal for people to have mixed feelings about change when confronted with new possibilities. Remember that people are more likely to change when they talk about the change themselves. Wanting to change is fundamental but it is not always enough and people often need help believing that change is possible, and it requires persistence.

A critical component of Motivational Interviewing is a deliberate focus on helping the participant to talk about change. We know that specific types of discussions (e.g., reflecting back, open-ended questions, and affirming or praising) help people to talk about change, whereas others (e.g., confronting, shaming, giving too much information) tend to increase resistance to change (or reinforce the 'status quo'). What this means is that how you participate in Motivational Interviewing sessions (and in day-to-day life) may contribute (negatively or positively) to any changes attempted by the participant. In simple terms, we believe that supportive buddies who state explicitly that they believe and want the participant to change will exert a positive influence and help the participant to change. Such a buddy who exerts a positive influence on a participant's behaviour change might be thought of as a 'Motivationally-Consistent-Buddy'.

This supportive, collaborative and compassionate approach can be summarised as a motivational 'Spirit' (or style) and it differs considerably from a confrontational contemptuous approach. Support means actively trying to be of assistance to the participant in any way possible. Collaboration means being invested in the motivational process, interested in assisting the participant, and open to discussions about change.

What can you do?

Research suggests that there are relationships between the types of language used by a buddy and the types of responses a participant might make ... although exactly how this works is still not fully understood. The following notes and examples have been included here to provide you with some guidance and ideas to use in your buddy role. Much of this is probably 'common sense' but practice makes perfect, and some of the finer points are worth considering. Note that most of the examples given here are worded as they relate to physical activity, but other health-related behaviour changes can easily be substituted in each example.

One thing that we probably all do from time to time is to 'jump in' and try to 'fix' things for others ... rather than 'helping people to help themselves'. This has been called the righting reflex. Resisting the temptation to jump in is often difficult. Taking a more reserved approach generally takes longer but the results are usually more enduring.

Different types of discussions and language, their level of helpfulness, and examples

Helpfulness: Very helpful

Encouraging statements: These comments do not necessarily have to be directly related to changing a particular health behaviour, they may simply be generally supportive. Such comments may convey that you are agreeing or siding with the participant. Statements of concern are also considered to be encouraging and supportive. Buddy statements that specifically refer to helping the participant change his or her level of physical activity, are definitely helpful.

Examples:

"I know what he's going through. I've been through the same things and it's hard."

"Whatever he has to do, I support."

"I will get out and walk with you if that helps"

Open questions: Open-ended questions typically begin with words such as "Why" , "What" and "How", or phrases such as "Tell me about..." and generally cannot be answered "yes, no or maybe." An open-ended question is designed to encourage a full, meaningful answer. It is the opposite of a closed-question, which encourages a short or single-word answer (including numbers). You can use open-ended question to explore ideas and to develop possible solutions to any problems or barriers to change. Note: beware of falling into the 'question & answer trap' whereby the 'expert' controls the conversation by asking a series of questions while the person merely answers with short answers. To break this cycle, it is suggested that another type of comment be inserted such as an affirming statement, reinforcing strengths or making a statement of appreciation or understanding.

Examples:

"What do you think would be the advantages to you if you were to be more active?"

"As you look at your life, what sort of successes have you had in the past that make you think that maybe you could do this, as well?"

"What would be the worst thing that could happen to you if you continued being inactive?"

"Think ahead five years... how would it be for you if you were to become fit and active?"

Affirming: One can reinforce discussions about change simply by commenting positively about the intended change or by reinforcing strengths (compliments, statements of appreciation and understanding).

Examples:

"That sounds like a good idea"

"I think that would work for you"

“That’s a good point”

“That’s a great plan”

“You are clearly a resourceful person, to cope with such difficulties for so long” (reinforcing strengths)

“It seems like you are really strong-willed” (reinforcing strengths)

Talking about change: These comments may describe the benefits that would come to the participant as a result of changing, as well as comments that reflect the participant’s motives for making the change. Talking about change also includes commenting on qualities the participant has that will support his or her efforts to change, including comments about ability and reasons and comments that strengthen confidence and commitment. Note that comments about your own activities (when intended to help the participant change his or her behaviour) are helpful, encouraging and supportive, but these may be somewhat less effective than discussions specifically about the participant’s own intentions to change.

Examples:

“I think that he’s come to recognise that he just can’t go on like this.” (motives)

“I’d like him to have a better life, be fitter and healthier.” (benefits)

“I think he can do it if he puts his mind to it.” (ability)

“I see that when she does exercise she always feels so much better afterwards.” (benefits)

“I think he’s much more determined to make a change this time.” (qualities/commitment)

Helpful ... but use some caution

Giving advice: Any discussions that include making a suggestion, or offering a solution or possible action are considered as Giving Advice. Comments from you that provide suggestions on what the participant could do in particular situations are also considered as Giving Advice. This can include comments that give directions or instructions, or statements of the buddy’s expectations for the participant’s behaviour. These statements should convey the quality of support, and importantly should use conditional language (“could,” “why don’t you,” “maybe”). These comments often emerge in the process of formulating a plan for change and often include ideas or suggestions from the buddy as to how the participant could change.

Note: Buddy advice-giving can be associated with both positive and (at times) less positive outcomes. When you are offering potential solutions to the participant, these may be met with agreement but sometimes advice might be met with ‘resistance’. Resistance is a cue to stop pursuing this line of conversation, and means that the participant is simply not ready to discuss the topic at this time. Buddy discussions in the form of advice-giving may be a delicate balance and an understanding of how the participant reacts to being given advice will obviously be helpful. Avoid arguing with the participant or

trying to convince them that they are wrong or misguided. Again, tone of voice and the use of conditional language (“could,” “why don’t you,” “maybe”, “perhaps you could”) are often critical to a good outcome.

Examples:

“Why don’t you try going to a gym?”

“Perhaps you could ask your friends if they want to form a walking group.”

“Maybe I could look after the kids and you could fit in a run each week.”

“You could cut down on TV a little to free up some time.”

Not so helpful/neutral

Discussing Self: Any comments that you make about yourself generally, or about your own engagement (or not) in healthy behaviours, is considered to be discussing self. These discussions may refer to the past, present, or future. Although these types of discussions are usually well intentioned (as they are often used to ‘lead by example’ or ‘show what can be done’), research shows that they may be less helpful than talking about the participant’s change directly (it’s not that such discussions are unhelpful... just that they may take too much time away from talking directly about the participant’s change).

Examples:

“I’m a motivated person.”

“It’s hard to exercise by yourself, but I do it.”

“Sometimes I just get fed up with things how they are and I know I have to change.”

“I used to run marathons.”

“When I don’t go to the gym, I get agitated.”

Definitely not helpful!

Confrontation: Language that conveys disapproval, disagreement, or negativity is considered to be confrontational and this includes directly disagreeing, arguing, correcting, shaming, or blaming the participant. Comments that seek to, judge, label, ridicule, or question the participant’s honesty are also considered confrontational. Re-emphasising negative consequences that are already known by the participant is also considered to be confrontational. Confrontation also includes language that actively discourages the participant from his or her goals. Language that refers negatively to past attempts at change is also considered to be confrontational. While this may all seem obvious, it is not uncommon for disagreeing, arguing and/or criticising to ‘creep’ into discussions about change... even when people have the best intentions. Note that tone of voice alone can be the crucial difference between being supportive and confrontational.

Examples: Confrontation

“Believe me; I’ve heard this story before.”

“That’s what you said last time you joined the gym.”

“You should have thought about that before!”
“You bought a new bike but you never use it.”
“Oh, like that’s really going to happen.” (sarcastic tone of voice).
Directing

“You have to just get out the door and do it.”
“You need to...”
“You’ve got to...”
“You must...”
“You can’t...”
“You should...”

Countering Change: This category includes language that minimises the importance of the participant engaging in physical activity or statements that refer to barriers to changing, or positive aspects of the status quo. Comments from you that refer to unsuccessful past attempts to change in a critical or unconstructive way would also fit here and should be avoided.

Examples:

“I don’t think he can do it.”
“I don’t know if exercise is for you...maybe it is easier to just pop a pill.”
“You’ve tried to get into it so many times in the past. It’s never worked.”

More suggestions, ideas and tips for brainstorming

Remind the participant (gently) that being constantly mindful requires effort ... it is unlikely to ever become completely automatic and that it often takes repeated efforts to make most changes and that this is normal.

Help assess and troubleshoot any problems and examine other options/solutions. In particular, examine any aspects of context, setting or triggers that pose potentially derailing demands or challenges.

Use open-ended questions to elicit ideas about being able to ‘re-start’ the change process spontaneously (or with your help) if for some reason plans and routines become interrupted.

Encourage the participant to tell others (e.g., family, peer group) about any goals that they have set.

Discuss accountability: In the event that you both establish a relationship based on trust, and perhaps rules or expectations (perhaps unspoken), then a link or accountability will be formed, and this may further strengthen motivation for change.

Good Luck ... and thanks for participating

David Brinson

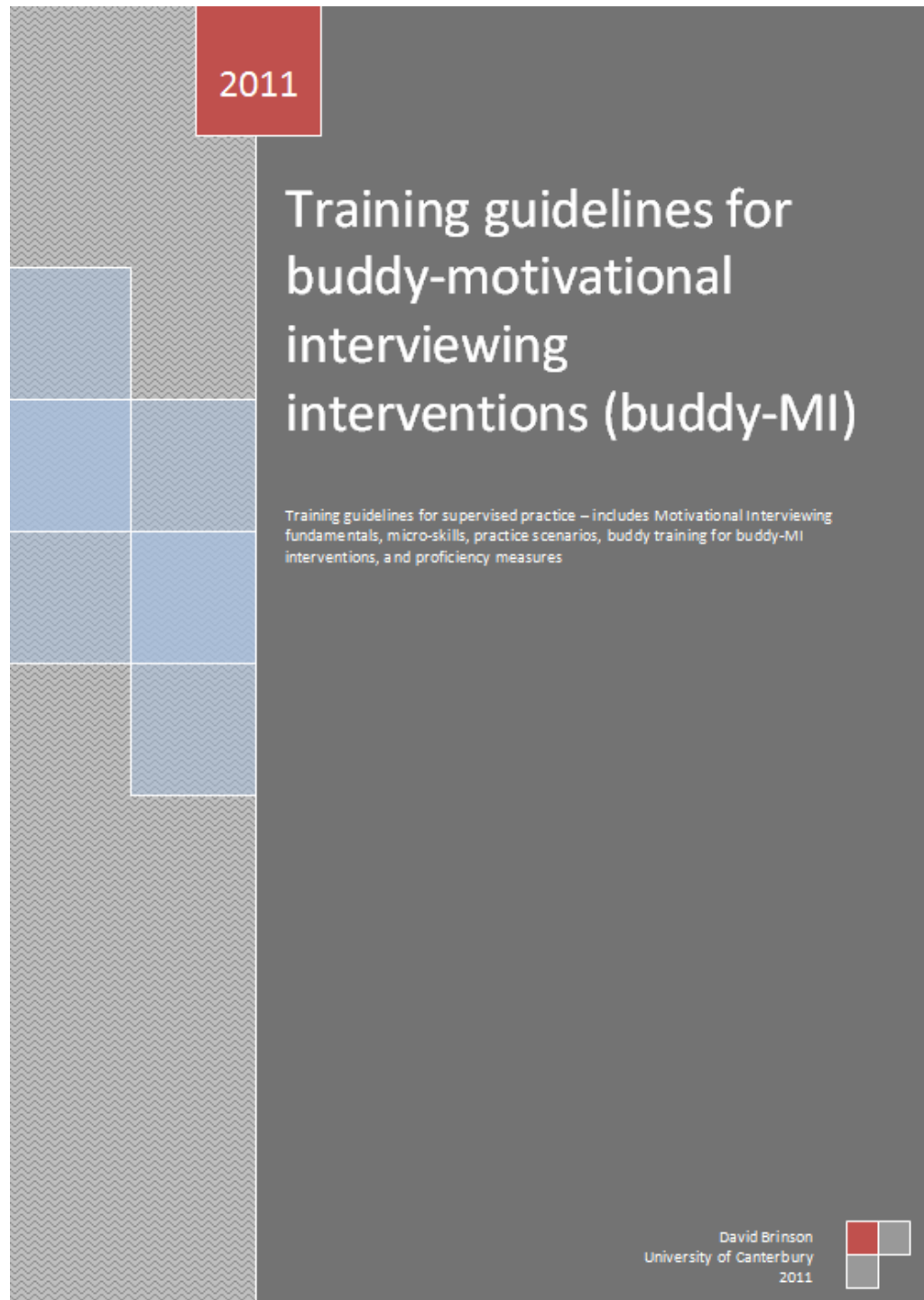
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11.8 Buddy-basics DVD cover art



11.10 Training guidelines for interventionists



Training guidelines: remember the OARS

Introduction

The following training guide differs from a ‘training manual’ or ‘procedural manual’ in that it is not prescriptive – the following strategies, examples and scenarios are for training purposes only. The actual Motivational Interviewing (MI) process is client driven and different questions, reflections and strategies will suit different individuals at different times, under different circumstances. The four scenarios (beginning p. 8) are generalised and some participants might engage with the change process much more quickly or slowly than outlined and others perhaps not at all. The example questions and reflections listed below illustrate the style of questions and responses that might be used during MI sessions, not necessarily questions that should be asked of all participants.

Open questions

- Use an open-ended question to see how the participant feels about physical activity (e.g., “You obviously have at least some interest in physical activity and health, because you have enrolled in this study ... How do you feel about all this?”).

Set agenda

- Talk about what service is available in terms of meeting times and frequency to talk, helping the participant to explore their thoughts and decisions about becoming physically active and how the process can help the participant think through those decisions.
- Tell the participant this will be different from other conversations (e.g., “I won’t be lecturing you or telling you what to do – just helping you to explore your options”).
- Set the participant up as the expert. (e.g., I am not going to be the expert, because you are the best person to be expert about what might suit your lifestyle”).

Discuss confidentiality

- All information collected in the research study will be held in confidence, and if it is presented or published, all personal details will be removed. Some of the video-recordings may be randomly selected by the study supervisor for review, and that they will be checked against defined quality criteria (this is to ensure that sessions are conducted as they are supposed to be – not a rating or ‘judgment’ on how you are going). All video recordings will remain absolutely secure and confidential and that video-recordings will not be presented in any form, nor will any individually recognisable results be published.

Explore the participant's values

Ask the participant what is most important to them right now and why. If possible, use a complex reflection to begin to link the participant's values with the benefits that might come from engaging in physical activity.

Assess Importance / Confidence (perhaps use the visual analogue scale below)

- Ask how important the participant thinks it is for them to make the change to being more physically active (e.g., "Let's say we have a scale from 0 to 10 where 0 is not important at all and 10 is extremely important. How important is it to you right now to increase your physical activity levels: to improve and maintain your health?").
- **Regardless of the level given ...** the practitioner asks "Why a (number given) and not a zero?" (Phrased to elicit reasons to change or confidence to change: not why to maintain the status quo)
- Ask how confident the person feels that they could make the change (e.g., "Let's say we have a scale from 0 to 10 where 0 is not confident at all and 10 is extremely confident. How confident are you that you can fit good healthy levels of physical activity into your lifestyle?").
- **Regardless of the level given ...** the practitioner asks "Why a (number given) and not a zero?"



Reflect!

Ask questions to elicit Change Talk (but also throughout the process)

Examples:

- Ask about the advantages of change (e.g., "What do you think would be the advantages to you if you decided to commit to being active?").
- Ask about the disadvantages of staying the same (e.g., "What do you think would be the disadvantages to you if you kept on with a sedentary lifestyle throughout your time at university and beyond?").
- Ask about intention to change (e.g., "So what would you be willing to try in terms of becoming more active?" or "Never mind how to make it happen right now, but what do you want to happen in terms of getting fitter and improving your health?").
- Ask about optimism and self-efficacy for change (e.g., "As you look at your life, what sort of successes have you had in the past that make you think that maybe you could do this, as well?").

- Ask about a worst case scenario (e.g., “What would be the worst thing that could happen to you if you continued being inactive? How would that affect things that you value?”).
- Look forward (e.g., “Think ahead five years... how will it be for you if you were to become fit and active ...” or “In terms of your fitness and health, how would you like things to be for you five years from now?”).
-

When a participant mentions a concern or a negative, ask them to elaborate about it. (e.g., “When did that happen last”? “Tell me more about that”, or “Can you give me an example of that?”).

Reflect!

- Ask the person to talk about how the behaviour is linked to the things that they value.
- When a participant spontaneously mentions one of the things they value, reflect that it’s valuable to them [e.g., “Being able to relax is very important to you”]. Extend this response if possible to a complex reflection (e.g., “Being able to relax is very important to you and you think exercise might be good for helping you to manage your stress”).

Summarise

Summarise the participant’s arguments for change and/or their progress in the session/s so far”.

Readiness to change: use of key questions

- Use an open-ended question to see where the participant is at (e.g., “What do you make of all of this?”).
- Use an open-ended question to see what the participant wants to do next (e.g., “What do you think you want to do at this point ... about becoming more active?”).
- Encourage, and look for strength of decision (e.g., “How sure are you that you want to do this?”). If the strength of resolve is still pretty low (look out for the overly ambitious response) perhaps return to the basics to strengthen the persons resolve.

Reflect

More uses for open questions

- Query what options for change the participant has considered (e.g., “What are the different options you have considered to help you start exercising? What do you think would work for you?”).
- Query what other options they can think of now (e.g., “What other things do you think you could do to get started?”).

- Query how the participant feels about each option (e.g., “How do you feel about not watching so much TV and spending the time on physical activities?”).
- Query how the participant would go about doing each step (e.g., “So what would you need to do if you decide you want to put time aside for exercise, how could you plan this out?”).

Reflect

Offering information and suggestions- with permission

Only when the participant is “stuck” about what to do (or perhaps needs exercise specific instruction [use infrequently])

- Offer to give information, then only give it if they agree (e.g., “I often hear that people have trouble organising their time and fitting their exercise in... would you like me to give you some ideas of what has worked for others?”).
- Offer multiple solutions (e.g., “There are a few different things that you could do ... would some suggestions help t get you thinking? ... often people find ‘regular slots’ each week helpful, as it’s one less thing to think about when you know that on a particular day and place each week you are doing your walk or run or whatever. Alternatively ... some people find that it is easier to and others find)

Training guide: scenarios for buddy-MI.

NOTE: This training guide is in no way prescriptive, examples are training scenarios only, the process is entirely client driven. Some possible opportunities for buddy involvement and/or training are indicated where the **Buddy** appears in bold. The Helpful Responses Questionnaire (Miller et al., 1991) will be administered to all buddies at the first visit as a training/feedback tool (scores will also be reported in the Results section as buddy characteristics at baseline).

Scenario One	20min one-off: brief intervention
Scenario Two	50min one-off: brief intervention, Phase 1- Phase 2
Scenario Three	2x50min: Phase 1+ - Phase 2
Scenario Four	3x50min: Phase 2 change plans – Phase 2+

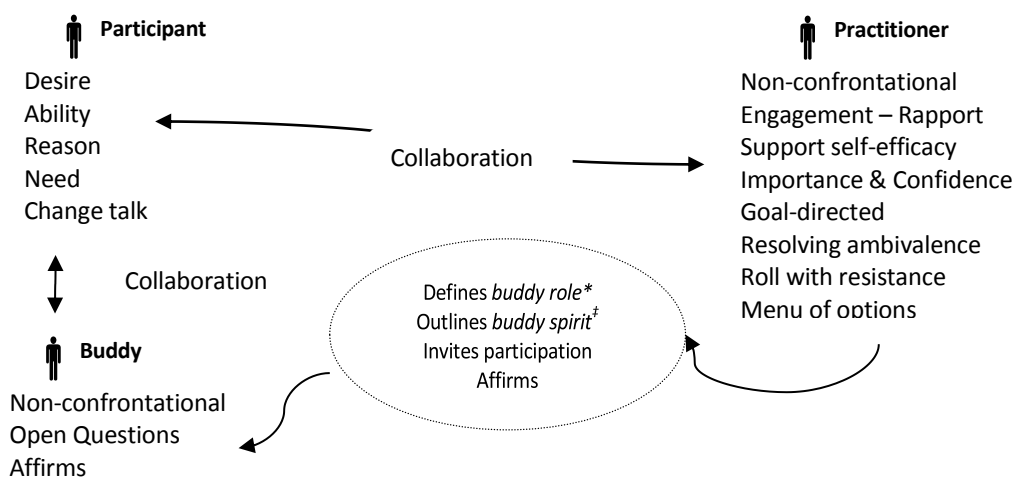
Scenario One – 1x20min one-off brief intervention

Establish rapport and engagement, define roles, request **buddy’s** commitment, and affirm.

Preamble

Support self-efficacy, and initiate questions/discussions about what might motivate change: including exploring ambivalence about changing habits and how specific behavioural changes might fit in with the participant’s vision for the future and the participant’s personal values. Establish a measure of importance and confidence and reflect on these. Emphasise autonomy and

emphasise to the participant that it is up to them to come back as often or infrequently as they like and that they will receive a reminder/follow-up prompt. Define the **buddy's** role and **buddy** spirit and demonstrate OARS. Provide the **buddy** with the instructional DVD.



Brief 20min one-off intervention

*Buddy roll = providing support in any form as needed/requested within the partnership.

‡Buddy spirit = asking not telling (Evocation), working together (Collaboration), but what you do is up to you (Autonomy) (ACE)!

A session of this brief nature may or may not result in significant change/commitment talk and/or commitment to further sessions. However, possible outcomes might include (a) the participant finishing the session motivated and ready for action, (b) the participant finishing the session interested in exploring his or her ambivalence further, with a view to becoming motivated, and with the intent of engaging in further sessions or (c) the participant finishing the session undecided about future sessions or actions or (d) the participant finishing the session uninterested in exploring his or her motivations further.

Scenario Two – 1x50min one-off (brief intervention, e.g., including change talk/commitment, possibly introducing a change plan)

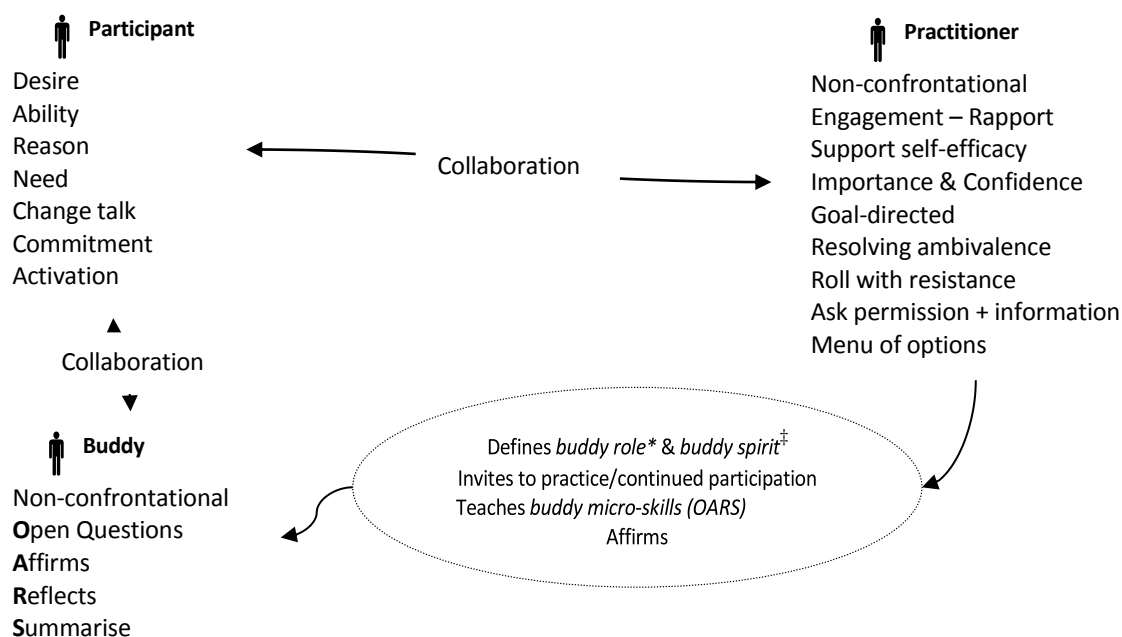
Preamble

Build rapport and engagement, re-define roles, invite the buddy to summarise on the last session as revision, affirm, and support self-efficacy (note: looking for DARN-and possibly CAT)†.

Up-date the measures of importance and confidence and use open questions to explore the reasons why/why not such ratings were given/changed. Continue to explore personally relevant factors relating to motivation and engagement in the change process (i.e., focused on the target behaviour). Continue exploring ambivalence about change and how specific behavioural changes might fit with the participant's vision for the future and personal values. Continue eliciting change and commitment talk if the participant is

ready (if judged sufficient DARN). Emphasise autonomy and emphasise to the participant that it is up to them to come back as often or infrequently as they like but that they will receive a reminder. A 50min session of this nature may/should result in some/significant change/commitment talk and/or commitment to further sessions and may approach phase-2 MI with the introduction/discussion of ideas and possible first steps towards a change plan.

A session of up to 50min should give enough time to engage the buddy in the practice of MI ... that is, the use of one or more of the basic micro-skills: open questions, affirmations, reflections, and summarising (OARS). Invite the buddy to 'open' the next session (and give suggestions [with permission] on how this could be done). Provide instructional DVD.



50min one-off intervention

*Buddy roll = providing support in any form as needed/requested within the partnership.

†Statements of Desire, Ability, Reason or Need – Commitment, Activation and Taking steps (DARN-CAT)

#Buddy spirit = asking not telling (**E**vocation), working together (**C**ollaboration), but what you do is up to you (**A**utonomy) (**ACE**)!

Scenario Three – 2x50min: including phase-1 DARN-CAT and possibly starting a change plan

Preamble

Build rapport and engagement, re-define roles, and invite the buddy to summarise on the last session as revision, affirm, and support self-efficacy.

Continue exploring the participant's ambivalence about changing habits and how specific behavioural changes might fit with the participant's vision for the future and the participant's personal values. Re-check importance and confidence and use open questions to explore the reasons why/why not such ratings were given and how these may have changed from the first session/s. Continue to explore personally relevant factors relating to motivation and engagement in the change process (i.e., focused on the target behaviour). Continue eliciting change and commitment talk if the participant is ready (note: looking for DARN-CAT)†. Emphasise autonomy and emphasise to the participant that it is up to them to come back as often or infrequently as they like but that we will be in contact with a reminder. A 50min session of this nature may/should result in some/significant change/commitment talk and/or commitment to further sessions and may approach phase-2 MI.

Phase-2

Phase-2 is where the focus shifts from building motivation to initiating action: this usually requires some level of instruction and the formulation of a change-plan. The giving of information must be done with sensitivity to the participant's readiness to learn about specific topics (e.g., "May I make a suggestion?" or "Would you like to hear about the kinds of changes you could make if you wanted to?"). In Phase-2 it is critical to keep the information provided concise and relevant to the participant.

The use of the formula "elicit-provide-elicit" should guide the exchange of ideas. Three key concepts are the use of conditional language, offering a menu of options, and taking time for short reflection breaks. Conditional language places limits or conditions on statements of fact, which helps the participant's mind stay open to different ways of understanding the information or options. Conditional terms include some, most, maybe, often, perhaps, likely, unlikely, typically, usually, possibly, and phrases such as "other people have found", "you might consider", or "some of my participants have found". Offering a menu of options involves suggestion a number of choices of methods or changes that can be considered. Short reflection breaks can be used to maintain rapport, and avoid information overdose.

Entering phase-2 requires a certain level of readiness and is typically characterised by significant Commitment talk, statements about Activation (or 'getting ready to change) and Taking steps (starting to actually do the new behavior) or CAT. Phase-2 might start with a transitional summary, an invitation to transition to the planning stage, feedback and clarification, pre-planning using key questions, identifying change options, goal-setting, creating an actual plan and making a commitment to putting the plan into action.

- **Transitional Summary:** used to summarise for the participant his or her own accomplishments in the change process: used when the participant appears ready to commit to change. These accomplishments might include attitudinal adjustments, insights into the need to change, increased hope, early experiments with change, and successes managing obstacles to change. The transitional summary concludes with an invitation to transition to the planning and/or goal setting stages (includes seeking feedback and clarification from the participant to ensure that he/or she is really ready and willing for change). Ask the buddy to check with the participant if their partner would like to make a commitment to developing a change-plan and if so, would they like to collaborate on the plan right now?
- **Key Question(s)** Ask key questions, open-ended questions that invite the participant to think about planning for change. The key questions strategy presumes that the participant is ready for these questions and will respond in a positive manner (e.g., “What steps are needed now for you to make progress on your goals?” or “What’s next?” or “Where should we go from here?” or “What is the most important task for you today?”).
- **Planning for Change:** goal-setting, identifying change options, creating a plan and commitment.

Set goals—using key questions, identify the first step to meeting the participant’s goals. Ask the **buddy** to summarise the goals their partner mentions, and ask the buddy to check with the partner that they are (the goals) the ones they want to meet. Ask the **Buddy** to check with the participant how realistic his or her partner’s goals are in relation to the type and amount of exercise being planned?

Identify change options—create a list of possible components/changes for a plan of action.

Create a plan—collaborate on a plan that identifies the participant’s challenges and strengths, support resources, and indicators of the plan’s success.

Ask the Buddy to request commitment—commitment to putting the plan in action.

Buddy training

Thought starter question for the **buddy**: “What do you think motivates change in yourself and others?”

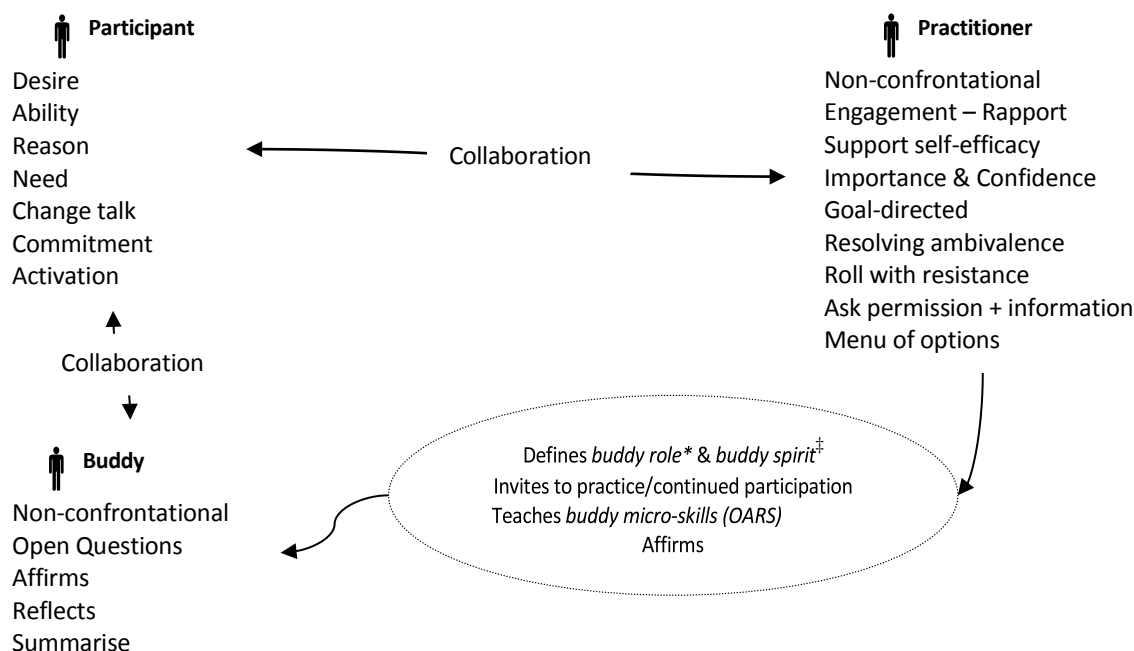
Buddy training

Explain that: While the counsellor/practitioner/**buddy**/others may be experts in what the person ought to do, the person has the expertise in what is important to him or her, and what is possible in the context of his or her daily life. MI assumes that participants have at least some of the answers they need and the practitioner/buddy’s job is to assist in bringing these answers out. Ambivalence (or wanting something but not wanting it, both at the same time) is normal when people are confronted with the possibility of changing

their behaviour, even when the evidence in favour of change is very clear or even overwhelming (smoking is a good example, as people generally know that smoking kills, but). People are more likely to change when they talk about it themselves. In MI this is termed “change talk”, and helping bring this about is a critical element.

The four key elements of MI address both what is discussed with the participant and the manner in which it is discussed: express empathy, roll with resistance, develop discrepancy and support self-efficacy. Empathy refers to letting the participant know that you (the buddy) understand how they feel about the targeted behaviour, and that you understand, but are neutral in your attitude about what the participant should do. Roll with resistance is related to empathy in that we avoid arguing with the participant or trying to convince them that they are wrong or misguided (and we are right!). Resistance is a cue to stop pursuing this line of conversation, and means that the participant is simply not ready to discuss the topic at this time. Develop discrepancy refers to helping people understand the inconsistency between their current behaviour and their personal values and goals. Supporting self-efficacy means that wanting to change is not always enough: people often need help believing that change is possible and that it takes persistence (although simple verbal persuasion may not be particularly effective, leading by example and using other people ‘similar to the participant’ or ‘respected’ by the participant may be effective).

Sessions of up to 2x50min should give enough time to engage the **buddy** in the practice of MI and the use of more than one of the basic micro-skills: open questions, affirmations, reflections, and summary (OARS). Invite the buddy to ‘open’ the next session (and give suggestions [with permission] on how this could be done).



2x50min: including phase-1 CAT

*Buddy roll = providing support in any form as needed/requested within the partnership.

†Statements of Desire, Ability, Reason or Need – Commitment, Activation and Taking steps (DARN-CAT)

‡Buddy spirit = asking not telling (**E**vocation), working together (**C**ollaboration), but what you do is up to you (**A**utonomy) (ACE)!

Scenario Four – 3x50min: including phase-2 change plans and relapse recovery strategies (requires advanced buddy-skills and a high level of interaction/collaboration)

Preamble

In scenario four, the participant has moved through the stages described in scenarios one to three and is committed to change, looking to or already formulating or expanding his or her goals, and refining the change plan. The focus of this session might be on consolidation and on relapse prevention/recovery strategies: for the participant who is already enthusiastically embracing the change process. Use open-ended questions to see what options for change the participant has considered/chosen and/or how things are working out following a change-plan (e.g., “How have the changes you have made [to increase your physical activity] played out since our last session?”). Use open-ended questions to see how the participant and the buddy feel about progress so far and what might come next (e.g., “What steps are needed now for you to continue your progress towards your goals?” or “What’s next?” or “Where should we go from here?”).

Phase-2+

Phase-2+ developments and ideas

Participant/Buddy: what other options can they think of together? (e.g., “What other things do you think you could do to reach a point where you are exercising regularly/maintaining your activity?”)

Perhaps ask the participant if they would like to set some longer-term goals for physical activity and fitness. If so, ask them what goals they want to set. Have the buddy summarise progress to date.

Relapse prevention: suggestions, ideas and brainstorming

Guide the **buddy** and participant to identify ‘triggers’ and ‘problem situations’ and discuss what they will do about them.

Relapse prevention

Discuss about how, when and where they (buddy and participant) might meet regularly, and talk to them about how they might implement a relapse prevention plan.

Use open-ended questions to see how the participant and the buddy feel about different options (e.g., [Participant] “How do you feel about your buddy following-up with you automatically at pre-organised time intervals, say weekly or fortnightly?)

Remind the participant that being constantly mindful requires effort ... it is unlikely to ever become completely automatic and that it often takes repeated efforts to make most changes and that this is normal.

Help the buddy and participant to assess and troubleshoot any problems and examine other options/solutions. In particular, examine any aspects of context, setting or triggers that pose potentially derailing demands or challenges.

Use open-ended questions to elicit ideas about how confident the participant is about being able to ‘re-start’ the programme spontaneously (or with the help of the buddy) if for some reason it (regular exercise) becomes interrupted.

If they need other options, brainstorm options and encourage them to choose/refine a reasonable strategy.

Encourage the participant to tell others (e.g., family, peer group) about the goal that they have met.

Encourage the participant to meet with others who have made similar commitments (e.g., an ‘accountability group’).

Mention options for how they can use what they have learned (e.g., helping others to be active).

Buddy training

Buddy training

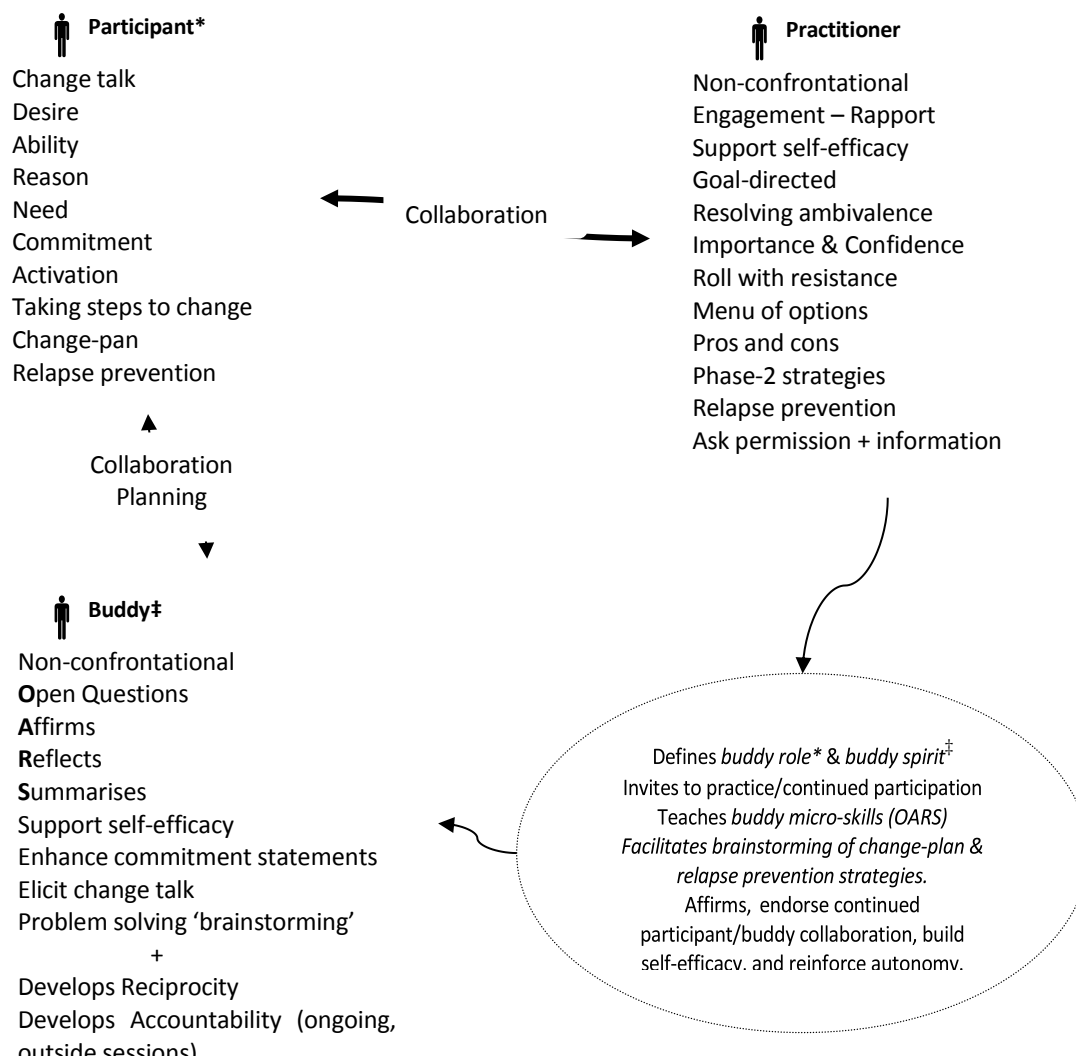
Brief the **buddy** on the importance of acknowledging the work their partner has done, and on encouraging the participant. Celebrate with him/her and help the participant decide on ways to celebrate.

Discuss accountability: In the present context, accountability has been used to describe any implied or explicit understanding between the participant and the **buddy** or any 'rules' (expectations established collaboratively) that orient the agent's behaviour (the participant) to the role 'enacted' by the overseer (the buddy). To the extent that the participant and the buddy establish a relationship based on trust and expected conduct (perhaps unspoken), then, a link will be formed between accountability and individual conscience.

Discuss reciprocity: The social norm of reciprocity is the expectation that people will respond to each other in similar ways that is, responding to a positive action with another positive action, and responding to a negative action with another negative action. Suggest that the **buddy** might think of ways in which he or she can maximise the things learned during the programme and carry them forward into their daily lives (e.g., "What can you take away from the programme and how might you apply that to your own lifestyle?").

Concluding summary

Make a concluding transition summary to bridge between the 'intervention period' and the 'self-supported' period of the programme. Affirm, endorse continued participant/buddy collaboration, build self-efficacy, and reinforce autonomy.



3x50min: including phase-2 change plans

*Buddy role = providing support in any form as needed/requested within the partnership.

†Statements of Desire, Ability, Reason or Need – Commitment, Activation and Taking steps (DARN-CAT)

‡Buddy spirit = asking not telling (**E**vocation), working together (**C**ollaboration), but what you do is up to you (**A**utonomy) (**A**CE)!

Quick tips for 'Buddies': Motivational Interviewing

While others may think they are experts in what another person ought to do, in reality, the person has the expertise in what is important to him or her, and what is possible in the context of his or her daily life. Motivational Interviewing assumes that a person has at least some of the answers they need and the buddy's job is to assist in bringing these answers out. Ambivalence (or wanting something but not wanting it, both at the same time) is normal when people are confronted with the possibility of changing their behaviour, even when the evidence in favour of change is very clear or even overwhelming. Remember that people are more likely to change when they talk about it

themselves. Wanting to change is fundamental, but it is not always enough: people often need help believing that change is possible: change requires persistence.

Buddy spirit or style

- Asking not telling: Non-confrontational
- Working together: Collaboration (Identify/offer possible change options)
- “But what you do is up to you”: Autonomy
- Empathy: understand or make an effort to grasp the other person’s perspective and feelings

Techniques

- Open questions: explore the what, why, how
- Affirmations/praise: offer supportive statements, input, feedback
- Reflections: convey understanding or facilitate further discussion/clarification
- Summary: bring ideas together, clarify, perhaps transition to other ideas

Quick-tips for MI Practitioners

Intro

“Thanks to both of you for coming along and thanks to you (buddy) for supporting (participant). Just you being here is demonstrating your support ... any we haven’t even got started yet”

“Before we get started, let me explain a little bit about how we’ll be working together”

“The style of this session is based on two important ideas

- (1) That people often need help to change and bringing in the buddy taps into social network effects, support and reinforcement,
- (2) That skills and ideas for health behaviour change should be ‘given away’ not kept within clinics, of offices, so that people learn how to self-manage their health”

Roles

“Participant you are the expert, no one knows better than you what might be right for you, the only person who can decide about possible changes is you ...”

“Buddy: Your role here as a support person is very important, thanks for your willingness to do this. At different points, I will be asking you for your input

and at any time you have something to add that you think is important please go ahead and do so. I would also ask you to think about how you can go on to support (participant) outside of this session”

“What I’d like to do is to try my best to understand your situation, and then help you consider what, if anything, you might want to do. If you decide you’d like to make some changes, I can help you with that. However, that’s certainly up to you, not me or anyone else.... so we are your helpers ... but your free will and your choices will always come first”

How does that sound to you?

Example questions

Practitioner to Buddy: Are there any things (the participant) hasn’t mentioned yet that you think are important here?

What else?

What do you mean?

Practitioner to Buddy: Let me pull you in here. Can you give me your perspective on this?

Practitioner to Buddy: Have you ever seen (participant) do something difficult that he wasn’t sure he could do?

Strategies- quick reference menu

- Open questions
- Affirming
- Reflections: simple/complex [reframing]
- Summaries: collecting/linking/transitional
- Pros and Cons (limited use)
- Exploring Goals and Values
- Confidence and Importance Rulers
- Looking Forward/Looking Back
- Typical day
- Selective reinforcement
- Enhancing commitment to change (summary; key questions; giving Information and advice [elicit-provide-elicit]; creating a change plan; goal setting; considering change options [planning]; designing an actual plan.

Examples

Open questions

What would you like to discuss?

What do you like about xxxxxx?

What changes have you noticed?

What are the most important reasons why you want to stop/start?

In the past, how have you overcome an obstacle?

What possible long-term consequences concern you most?

Affirming

Thanks for talking with me today.

I appreciate that you took a big step in agreeing to do this.

That's a good suggestion.

You're clearly a resourceful person, to cope with such difficulties for so long.

You seem like the type of person who

Note: affirm the participant's self-efficacy using specific examples that have come up in the course of the session/s.

Evocative questions**Disadvantages of the status quo: Participant**

What worries you most about your current situation?

In what ways does this concern you?

What is there about this that you or other people might see as reason for concern?

What might happen if things continue the way they are now?

Buddy:

What worries you about [participant's] situation [behaviour]?

What do you think will happen if [participant] doesn't change?

Advantages of change: Participant

How would you like things to be?

What would be the good things about change?

What would you like your life to be like five years from now?

What would be the advantages of making this change?

Buddy: What would be the good things about [participant] making [changes], from your perspective?

Optimism about change: Participant

Who could offer you support in making this change?

What personal strengths do you have that will help you succeed?

Think of a time when you have achieved something difficult, what resources did you draw on then?

Buddy:

What encourages you that [participant] could make a change he/she wanted to?

In what ways could you offer helpful support if [participant] chooses to make changes?

Intention to change: Participant

What do you think you might do?

So ... what do you intend to do?

What will you do from here?

What small step do you think you will do to move you in the right direction?

Of the different options we've talked about, which one or combination of

options sounds like the best fit for you?

What would you be willing to try?

Buddy:

How could you help there?

Listening for and action on:

Change talk: DARN-CAT

Change talk; refers to participant's statements that indicate an inclination or a reason for change.

Motivational modifiers: Preparatory change-talk- statements of Desire, Ability, Reasons and Need for change (DARN).

Desire: indicates a wanting, wishing, or willingness for change. Do you want to?

I want to be

I really wish I could

I just want to

Part of me wants to change this

I sort of wish things were different

Ability: indicates personal perceptions of capability or possibility of change.

Can you?

I'm positive that I could

I can do it

I might be able to ...

Reason: specifies a particular rationale, basis, incentive, or motive [leverage] for change. Why?

I definitely can't afford to get sick again

I'm putting on weight and it keeps going on!

I don't want to set the wrong example for my kids.

Need: indicates a necessity, urgency, or requirement for change

I definitely have to

I really have to change.

I probably need to do something about my lack of fitness

I guess I need to exercise more to stay healthy

Mobilising change-talk: Commitment, Activation and Taking steps to change (CAT).

Commitment:

I guarantee I'll

I'm prepared to stop smoking

I plan to cut down

I intend to change
I will change
I am going to do this

Activation: Talk about being willing to change: ready to, willing to but without specific commitment.

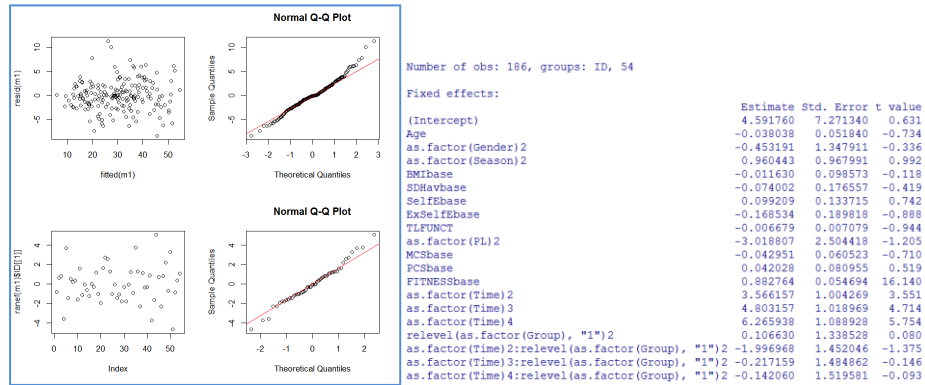
Taking Steps to change: is reporting recent specific actions (steps) toward change.

12 Appendix D

1. Statistical analysis: raw data and diagnostics
2. R statistical packages and descriptions
3. Qualitative exit-survey responses

12.1 Model diagnostic plots and R output

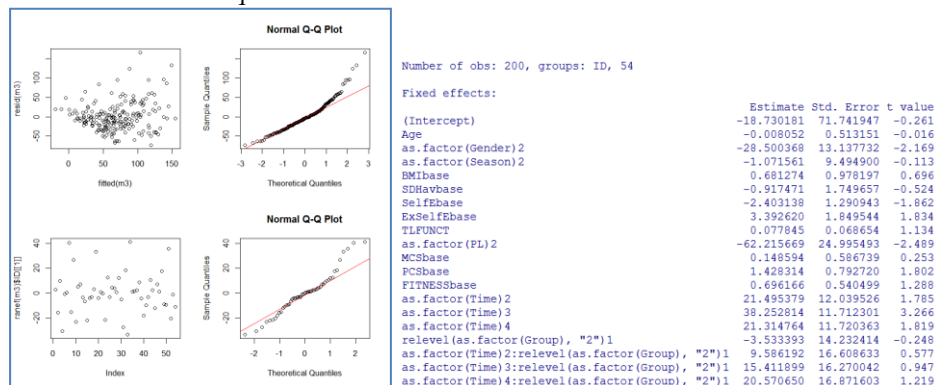
Variable: FITNESS



$R^2=0.363$

Variable	Baseline	1-month	3-month	12-Month
FITNESS	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	29.9	31.04	35.59	37.0
Buddy-group (TRI)	24.5	28.5	28.83	31.20

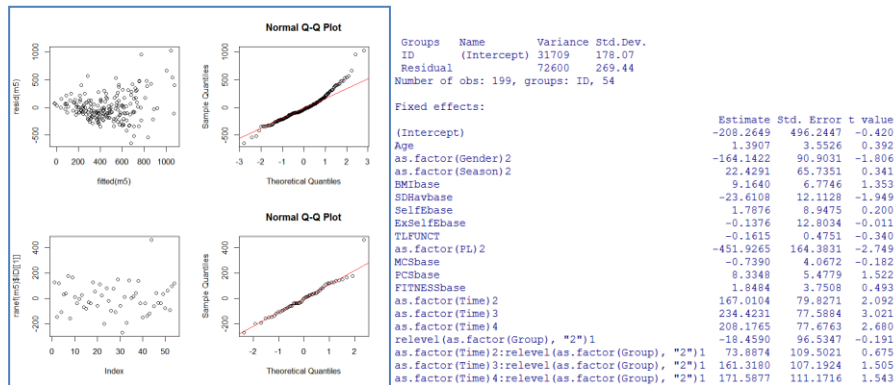
Variable: TMODEqv



$R^2=0.271$

Variable	Baseline	1-month	3-month	12-Month
TMODEqv	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	47	67	89	74
Buddy-group (TRI)	41	74	96	72

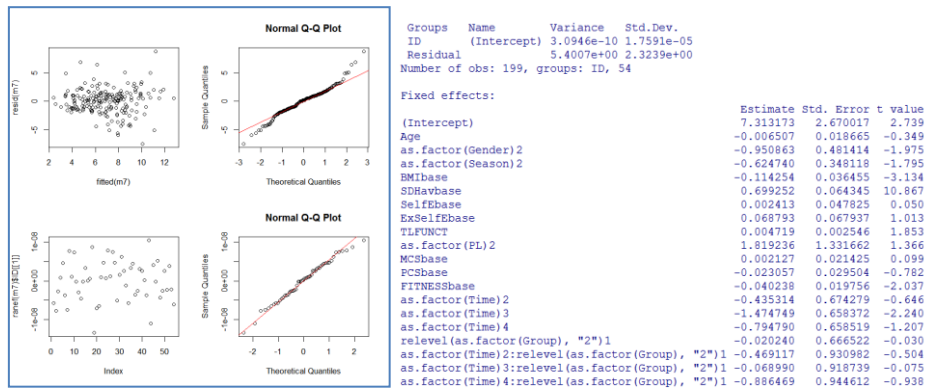
Variable: TPAmet



R²=0.325

Variable	Baseline	1-month	3-month	12-Month
TPAmet	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	276	470	592	554
Buddy-group (TRT)	253	498	634	533

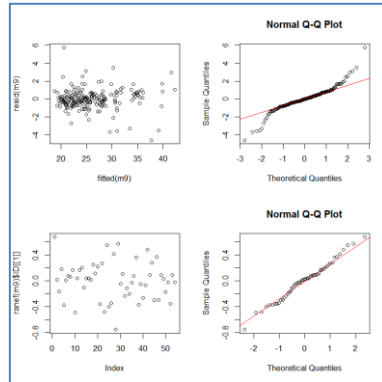
Variable: SDHav



R²=0.052

Variable	Baseline	1-month	3-month	12-Month
SDHav	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	7.8	6.9	6.3	6.5
Buddy-group (TRT)	7.5	7.2	6.2	6.7

Variable: BMI



Number of obs: 196, groups: ID, 54

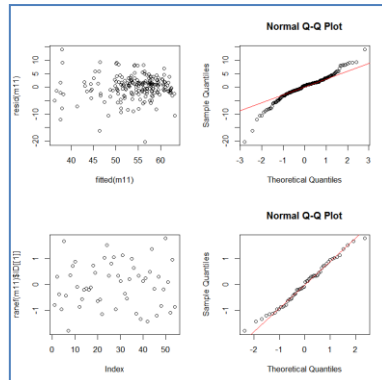
Fixed effects:

	Estimate	Std. Error	t value
(Intercept)	4.2977863	1.9195976	2.24
Age	0.0192964	0.0134903	1.43
as.factor(Gender)2	-0.4052717	0.3441845	-1.18
as.factor(Season)2	-0.1903117	0.2485472	-0.77
BMIbase	0.8990032	0.0262101	34.30
SDHavbase	-0.0237169	0.0463138	-0.51
SelfEbase	0.0331211	0.0336722	0.98
ExSelfEbase	-0.0748089	0.0482291	-1.55
TLFUNCT	-0.0003046	0.0017916	-0.17
as.factor(PL)2	-3.5141376	0.7590632	-4.63
MCSbase	-0.0085113	0.0152841	-0.56
PCSbase	-0.0211087	0.0210096	-1.00
FITNESSbase	-0.0124409	0.0140852	-0.88
as.factor(Time)2	0.1480899	0.3768257	0.39
as.factor(Time)3	-0.1208141	0.3715517	-0.33
as.factor(Time)4	-0.6910221	0.3617296	-1.91
relevel(as.factor(Group), "2")1	-0.0607622	0.4038850	-0.15
as.factor(Time)2:relevel(as.factor(Group), "2")1	-0.4566591	0.5161868	-0.88
as.factor(Time)3:relevel(as.factor(Group), "2")1	-0.5042953	0.5120350	-0.98
as.factor(Time)4:relevel(as.factor(Group), "2")1	-0.3701462	0.5199787	-0.71

R²=0.17

Variable	Baseline	1-month	3-month	12-Month
BMI	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	26.3	26.2	26.1	25.6
Buddy-group (TRI)	27.1	25.7	26.2	25.2

Variable: PCS



ID (Intercept) 3.0059 1.7337
Residual 22.5643 4.7502
Number of obs: 199, groups: ID, 54

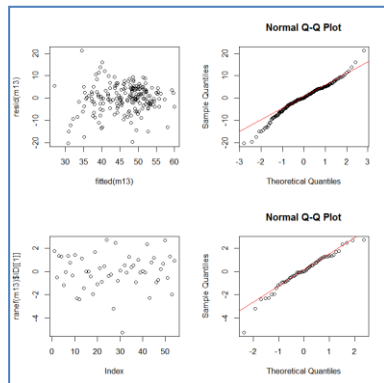
Fixed effects:

	Estimate	Std. Error	t value
(Intercept)	19.712660	6.630905	2.973
Age	-0.029199	0.047065	-0.620
as.factor(Gender)2	-1.360455	1.211864	-1.123
as.factor(Season)2	-0.398397	0.877034	-0.454
BMIbase	-0.098291	0.090638	-1.084
SDHavbase	-0.068678	0.160801	-0.427
SelfEbase	-0.151460	0.118964	-1.273
ExSelfEbase	-0.078882	0.174896	-0.451
TLFUNCT	-0.010125	0.006352	-1.594
as.factor(PL)2	-7.665149	2.811656	-2.726
MCSbase	0.097440	0.054483	1.788
PCSbase	0.737365	0.073421	10.043
FITNESSbase	0.069116	0.049571	1.394
as.factor(Time)2	1.276091	1.365942	0.934
as.factor(Time)3	1.611677	1.366021	1.180
as.factor(Time)4	1.363432	1.350017	1.010
relevel(as.factor(Group), "2")1	1.227820	1.469098	0.836
as.factor(Time)2:relevel(as.factor(Group), "2")1	-2.943609	1.897742	-1.551
as.factor(Time)3:relevel(as.factor(Group), "2")1	-0.199056	1.896185	-0.105
as.factor(Time)4:relevel(as.factor(Group), "2")1	0.939405	1.941927	0.484

R²=0.087

Variable	Baseline	1-month	3-month	12-Month
PCS	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	52.7	53.5	54.1	53.7
Buddy-group (TRI)	53.5	53.6	55	54.9

Variable: MCS



Random effects:
Groups Name Variance Std.Dev.
ID (Intercept) 7.8611 2.8038
Residual 45.7715 6.7655
Number of obs: 199, groups: ID, 54

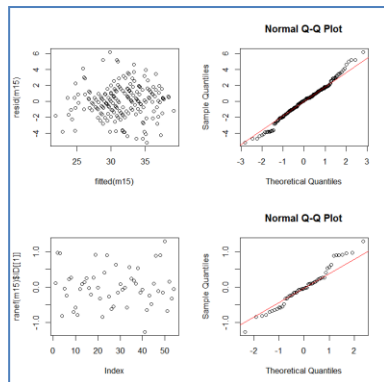
Fixed effects:

	Estimate	Std. Error	t value
(Intercept)	-2.688458	9.876189	-0.272
Age	0.049112	0.070254	0.699
as.factor(Gender)2	1.312192	1.807329	0.726
as.factor(Season)2	-1.078235	1.307975	-0.824
BMIbase	0.146529	0.134974	1.086
SDHavbase	0.167666	0.239827	0.699
SelfEbase	-0.125589	0.177541	-0.707
ExSelfEbase	-0.258352	0.260307	-0.992
TLFUNCT	0.012314	0.009466	1.301
as.factor(PL)2	6.096848	4.028731	1.513
MCSbase	0.615161	0.081245	7.572
PCSbase	0.310903	0.109386	2.842
FITNESSbase	0.025517	0.073980	0.345
as.factor(Time)2	3.878853	1.946726	1.993
as.factor(Time)3	5.071022	1.946827	2.605
as.factor(Time)4	4.424704	1.923574	2.300
relevel(as.factor(Group), "2")1	-1.641519	2.135431	-0.769
as.factor(Time)2:relevel(as.factor(Group), "2")1	-0.030725	2.704608	-0.011
as.factor(Time)3:relevel(as.factor(Group), "2")1	-0.727998	2.702447	-0.269
as.factor(Time)4:relevel(as.factor(Group), "2")1	-2.501901	2.767921	-0.904

R²=0.13

Variable	Baseline	1-month	3-month	12-Month
MCS	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	41.7	46.7	47	47
Buddy-group (TRT)	43.7	47.2	48.9	46.6

Variable: SelfE



ID (Intercept) 0.93407 0.96647
Residual 4.99443 2.23482
Number of obs: 202, groups: ID, 54

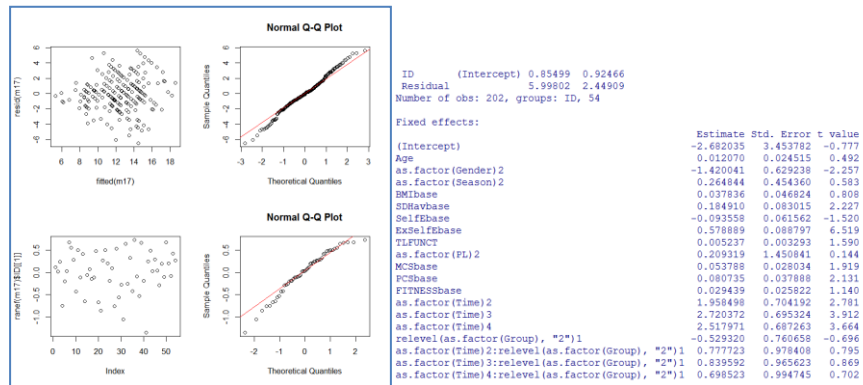
Fixed effects:

	Estimate	Std. Error	t value
(Intercept)	5.519591	3.313991	1.666
Age	-0.043377	0.023580	-1.840
as.factor(Gender)2	-1.184345	0.604814	-1.958
as.factor(Season)2	0.052574	0.436786	0.120
BMIbase	0.051627	0.044946	1.149
SDHavbase	0.211495	0.079823	2.650
SelfEbase	0.633646	0.059239	10.696
ExSelfEbase	0.024717	0.085313	0.290
TLFUNCT	0.006692	0.003164	2.115
as.factor(PL)2	0.353149	1.332748	0.265
MCSbase	0.074673	0.026966	2.769
PCSbase	0.021221	0.036392	0.583
FITNESSbase	-0.017486	0.024833	-0.704
as.factor(Time)2	0.531602	0.643016	0.827
as.factor(Time)3	1.220857	0.634814	1.923
as.factor(Time)4	1.982281	0.627345	3.160
relevel(as.factor(Group), "2")1	-0.470380	0.710428	-0.662
as.factor(Time)2:relevel(as.factor(Group), "2")1	1.224542	0.893422	1.371
as.factor(Time)3:relevel(as.factor(Group), "2")1	0.676154	0.881643	0.767
as.factor(Time)4:relevel(as.factor(Group), "2")1	0.297398	0.908474	0.327

R²=0.143

Variable	Baseline	1-month	3-month	12-Month
SelfE	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	30.8	31.8	32.1	32.9
Buddy-group (TRT)	29.7	31.2	31.6	32

Variable: ExSelfE



R²=0.331

Variable	Baseline	1-month	3-month	12-Month
ExSelfE	Mean	Mean	Mean	Mean
non-buddy group (CTRL)	10.6	12.5	13.4	13.3
Buddy-group (TRI)	10	12.8	13.5	13.3

12.2 R statistical packages and descriptions

lme4-package

Linear, generalized linear, and nonlinear mixed models.

Package 'lme4'

October 25, 2013

Version 1.0-5

Date 2013-10-25

Author Douglas Bates [aut], Martin Maechler [aut], Ben Bolker [aut, cre],
Steven Walker [aut]

URL <https://github.com/lme4/lme4/> <http://lme4.r-forge.r-project.org/>

Description Fit linear and generalized linear mixed-effects models.

The models and their components are represented using S4 classes and methods.

Differences between nlme and lme4

lme4 covers approximately the same ground as the earlier nlme package. The most important differences are:

- lme4 uses modern, efficient linear algebra methods as implemented in the Eigen package, and uses reference classes to avoid undue copying of large objects; it is therefore likely to be faster and more memory-efficient than nlme.
- lme4 includes generalized linear mixed model (GLMM) capabilities, via the glmer function.
- lme4 does not currently implement nlme's features for modeling heteroscedasticity and correlation of residuals.
- lme4 does not currently offer the same flexibility as nlme for composing complex variance-covariance structures, but it does implement crossed random effects in a way that is both easier for the user and much faster.
- lme4 offers built-in facilities for likelihood profiling and parametric bootstrapping.
- lme4 is designed to be more modular than nlme, making it easier for downstream package developers and end-users to re-use its components for extensions of the basic mixed model framework. It also allows more flexibility for specifying different functions for optimizing over the random-effects variance-covariance parameters.

Package 'psych'

Procedures for Psychological, Psychometric, and Personality Research

October 14, 2013

Version 1.3.10.12

Date 2013-10-12

Author William Revelle <revelle@northwestern.edu>

Maintainer William Revelle revelle@northwestern.edu

URL <http://personality-project.org/r>

<http://personality-project.org/r/psych.manual.pdf>

Description: A number of routines for personality, psychometrics and experimental psychology. Functions are primarily for scale construction using factor analysis, cluster analysis and reliability analysis, although others provide basic descriptive statistics. Item Response Theory is done using factor analysis of tetrachoric and polychoric correlations. Functions for simulating particular item and test structures are included. Several functions serve as a useful front end for structural equation modeling. Graphical displays of path diagrams, factor analysis and structural equation models are created using basic graphics. Some of the functions are written to support a book on psychometrics as well as publications in personality research. For more information, see the personality-project.org/r webpage.

LanguageR-package

Data sets and functions for 'Analyzing Linguistic Data'

Version: 1.0

Date: 2007-01-15

License: GNU public license

Author(s): R. H. Baayen, University of Alberta, Edmonton, Canada

The main function of this package is to make available the data sets discussed and analyzed in 'Analyzing Linguistic Data: A practical introduction to statistics using R', to appear with Cambridge University Press, 2007.

Includes for example:

`lmer` functions: (p-values for mixed-effects models with `lme4`)

`pvals.fnc`: p-values for table of coefficients including MCMC

`pvals.fnc`: p-values and MCMC confidence intervals for mixed models

Reference: R. H. Baayen (2007) *Analyzing Linguistic Data: A practical introduction to statistics using R*, Cambridge: Cambridge University Press.

12.3 Qualitative exit-survey responses

EXPERIMENTAL GROUP Exit Survey responses

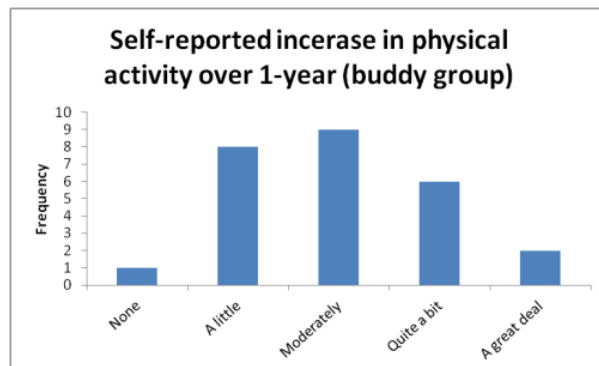
Q1 What changes (if any) did you make in your day-to-day life as a result of the programme?

- 1 Many factors changed in my life during the course of the study. Social, work and other, but a new factor was introduced and I became a very regular dog walker /now occasional jogger, and also reconnected with mountain biking
- 2 Did less..eg maybe 3 sets of exercises at home instead of a full on training session. When I felt fatigue stopped. Tried for more lifting for cardio then running
- 3 I have relied heavily on my buddy and as a result we have both made lifestyle changes that has seen him take up running and myself complete two half marathons in six months.
- 4 Thought about small ways to increase physical activity, like taking the stairs instead of the lift Go for more walks with friends and walking a friend's dog
- I have always avoided running like the plague...but now I am running 2-3 times a week! It's something I have never done in my life until now and I am so proud of myself. [REDACTED] also comes for runs with me 1 or 2 times a week, even though I am still a lot slower and more unfit than him. [REDACTED] has been a big part of helping me to get exercising and he has done this in a very respectful way, doing things with me when I've been ready (i.e buying running shoes, starting off with walk/ jogs in the park). We've started to make running something we can do at least once a week to spend quality time together in our busy schedule too. I have also done really little things like walking the long ways around classrooms at placement, walking extra flights of stairs, getting up off the couch more at home, just tiny things to add extra movement into my day. I had also started ballet dancing again at the start of the after a 5 year break, But my physio's advised me to stop for a while and do clinical Pilates before going back because of my hip problems and a slipped disc in my back. I am also feeling positive about this as it will be more exercise and a way for me to safely get back into dancing. I also had a few months at the start of the year when I went swimming 2-3 times a week- I had never tried swimming for exercise before and I was pleasantly surprised that I really enjoyed it!- I wouldn't have known that without trying it because of the programme,
- 5 Each week, I make sure I do some form of exercise.
- 6 Drove to pool in winter so I would still exercise. Went on bike rides with others to motivate me
- 7 I did make a bigger effort to walk regularly
- 8 I still haven't developed any solid routine but the motivation to exercise is higher and I have better understanding of the reasons why I may have previously not been exercising as much.
- 9 More motivated - aware that there would be questions to answer on a regular basis.
- 10 More active, stop smoking
- 11 For a time I exercised regularly
- 12
- 13
- 14
- Prior to getting pregnant, this programme was really beneficial for me. I was having limited back pain and could participate in most activities I wanted. Working out vigorously for 30 minutes was a huge goal for me and I did it.
- 15 At the start I made more effort, but overall it hasn't made a significant change.
- 16 went to the gym more
- 17 did more physical exercise; used bike more as transport rather than car or bus
- 18 Increase in activity. Increased confidence
- 19 Introduced evening walks. Used the stairs in [REDACTED] as an exercise route. Always looked at what I was doing and recognised my shortfalls
- 20 I have recognized that going out with my horse and up and down the hill is actually sport.
- 21 I did start running and bought a cross-trainer that I use.
- 22 Thought more about the benefits of physical activity including mental health.
- 23 Focused on a minimum 10min physical activity commitment on a daily basis
- 24 More active
- 25 The programme motivated me to take stock of my physical activity and inspired me to take a more organised, consistent approach to my exercise. As a result, my mental health has improved dramatically, and I am able to deal with difficult situations in a much more positive manner.
- 26 I found that I have exercised more regularly. I have placed a higher importance on exercise than I did previously.
- 27

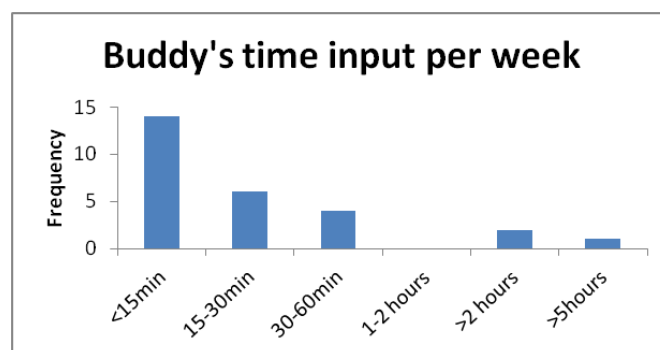
Q2 What did you learn during this program that you can use in the future?

1 Just do it
2 longer goals with smaller steps, a buddy is probably useful (mine didn't work out at all!)
3 The importance of pairing up people with the right partner
Having someone to motivate me was good, we played tennis, sport is an easier way to get more physically
active. Like going to the gym with a friend, or playing a sport to keep you motivated. It's more fun with
4 friends
It is so helpful to have [REDACTED] being a motivator for me to exercise! It has also been so helpful for him too as
I started going out for runs initially without him, and then he caught the running bug too and wanted to join
me. Before this, [REDACTED] hadn't really been exercising for the past few years, but as he has seen how important
it is to me, it has also become important to him to be fit and healthy. This is a health behaviour I hope we can
both continue to work on together for the rest of our lives, and I am grateful to have a partner who finds this
as important as I do! I changed my views about exercise as being about losing weight, to being about being
healthy and looking after my body to improve my health for now, and an investment for the future. When I
can hardly breathe while running, I would have normally gotten angry because I was in pain and exhausted, but
now I see it as a good thing, and to push myself to keep going because I think of it as strengthening my heart
and lungs rather than an unpleasant feeling in my body. Overall, It was so good to have our sessions together
with [REDACTED] there as a buddy, because he got to see how important exercise is for me, and from that he was
very motivating for me. I have learnt that I really benefit from the extra support from others when starting to
try new things in exercising as that is the hardest time in the whole process for me. I am also trying to take
some of the ideas of the programme to try to motivate my [REDACTED] who has [REDACTED] to exercise
5 and eat healthier- So I feel like I can try to be a motivational buddy for others in the future myself!
6 I can achieve my goals, and it's much easier when you can exercise with others.
7 Just to little bits of exercise to start a day...then likely to do more
8 I need to be more organised and schedule in exercise times
I am more aware of the things that will impact my motivation and "want" to exercise, things like stress and
being unmotivated or lazy for want of a better word. I can use this to ensure that I don't let this attitude take
9 over and to make the best attempt to exercise regardless.
That circumstances can interfere with plans and good intentions can only take you so far, but that it is possible
10 to get back on track and keep going.
11 Confidence
12 I have been made aware of how lax I am about exercise. I found how much I enjoy exercise.
13
14
15 Perseverance. And the questioning at the beginning about altering my expectations helped a lot.
Using a mini calendar to write down physical activity when I do it so I can see visually how regularly I am
16 active is useful.
17 having a buddy helps because you have someone to answer to
18
19 Looking at a week or two rather than a daily measurement of activity.
20 A little is better than nothing.
21 Not sure. Maybe that it is important to move?
22 That I will exercise if otherwise I would let down a friend or colleague
23 It is good to have a support exercise buddy to keep accountable to.
That the 10mins is difficult to adhere to if it is not habitual and that once started it invariably translates into
20-40-60mins. That I tend to do a lot of physical activity in blocks (3-6weeks) then reduce to the minimum
commitment of 10mins. That my body retains memory of these blocks so it is easier to continue or resume
physical activity even if I stop completely for a period of time. That I feel better having done physical activity
plus it provides me with opportunities to enjoy what I love more (nature)
24
25
Everything worthwhile takes a calculated, reasoned and well thought out plan. Telling others of my intentions
increases the likelihood of me carrying them out as it attaches accountability. The idea of looking silly if I fail,
26 combined with the positive rewards makes for a perfect carrot and stick.
27 I learnt that talking through reasons for wanting to change motivated me to make those changes happen.

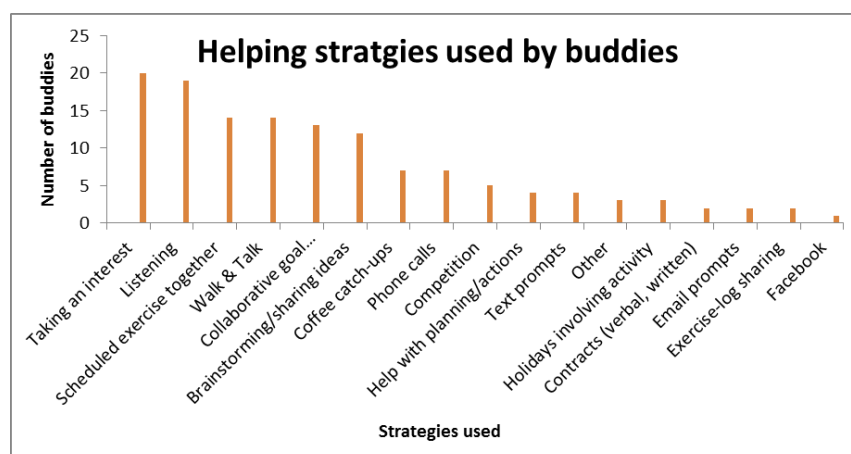
Q3 Over the last 12-months, how much have you increased and maintained your overall levels of leisure-time and/or transport-related physical activity?



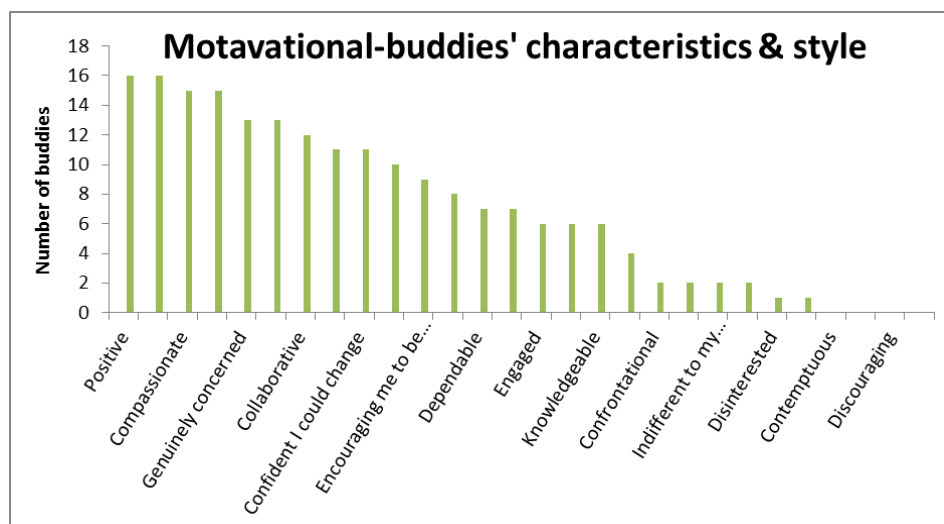
Q4 Please select the amount of time in a typical week that your motivational-buddy provided you with support (in any form).



Q5 Please select any number of items from the list below that describe the nature of the support provided by your motivational-buddy. What types of things did your motivational-buddy do?



Q6: Finally, we are interested in the ‘style’ of support and motivation your buddy provided as well as some characteristics your buddy might have demonstrated. Please select as many characteristics as applicable from the list below to complete the following statement:
On the whole, my motivational-buddy was...



Q7 Optional: Please make any further comments you like on any aspect of your experience with the programme?

- Please mention if any significant life-event influenced your participation in the programme and if so how.
- 1 Having a dog in our lives means walking every day - even if it is snowing
I didn't really get a programme together, got some good ideas about being less hard on myself. By doing less, I lost weight and felt better...now ready to work on my stamina. Enjoy weight lifting and now doing some salsa dance which is a good form of exercise. The earth quake directly affected my spin classes, but I'm more interested now... and the earthquakes directly affected my adreniline and cortisol levels... Thank you for keeping in touch and your enthusiasm....
 - 2 So happy that I have used exercise and my motivational buddy to get through an extremely difficult year of work and stress. Stress is still a huge factor but by keeping up with my exercise programme and running in half marathons I have been able to manage my stress levels! This programme also gave my buddy who is also my partner great foundations to build our healthy lifestyle together.
 - 3
 - 4 It got me to really think about my reasons for needing and wanting to exercise as a long term permanent change in my life, and also the life of my boyfriend. We think of ourselves as a little "family" unit, and it has been really exciting to be able to support each other to start exercising. This is something we are very invested in to carry on for the rest of our lives and whatever it has in store for us!
 - 5 At the end of 2012 I developed glandular fever which really set me back with my exercise regime.
 - 6 Yes life event having knee surgery dec 2013 meant I havent been able to cycle since then so need to drive most days
 - 7 I could have chosen someone who would have been more encouraging and supportive Last 4 weeks questions are no really a true reflection of my daily life as I have had an operation and while recouperating I am off work and quite limited in tasks I can participte in.
 - 8 Although being involved in the course with a buddy, the meetings held and the steps that were made were predominantly at a personal level, not influenced by the support of my motivational buddy. However, I think that this self motivation was much more beneficial, as I am aware that the reasons that I may or may not exercise much are dependant not on how much support I have from my buddy, but instead on the balance of other aspects in my life. The main issue that I found difficult was balancing study with exercise. Because I put my study first in any situation I find it difficult to spend an hour at the gym etc when I feel like I need to be doing work. I do however realise the importance of this time spent on exercise when I do take the time to do something, and I plan on ensuring that I develop a solid routine over my university break, as I know that it will be beneficial to ensuring that I am healthy and in a better mental state to cope with stress and other aspects of life throughout the rest of the year. I realise that I have made plans to set these goals previously, however due to moving cities and adjusting to a very full on degree, It became difficult. I am now aware what I need to do to ensure social, physical and mental balance in the second half of the year and the 4 years that are to follow.
 - 9 I particularly enjoyed the 1-on-1 sessions with David - very motivational. The ChCh earthquake had a huge impact mentally - more so than I realised. The final straw was living in a caravan from November through
 - 10

to April while our home was being repaired and coping with tradesmen and red tape produced by people who really don't see you as a person at all but just a number. It was extremely hard to stay motivated and positive during this time. Sleep patterns were shot to hell through waking up and grinding over events. A restructure at my work also had a negative impact. [REDACTED] I [REDACTED] [REDACTED] just to help us cope - despite getting exercise (more working around the house than planned - although we did still manage to get two or three bike-rides in). But, we kept on planning and working towards the future and have achieved our goal of living and working in [REDACTED]. We have been here a month and have 'nested' and are looking forward to hitting all the mountainbike tracks well wrapped up. Will be on the tracks seriously come spring as we are planning to do the [REDACTED] again come Easter. Meantime, I am walking for an hour every morning before work and about half an hour each lunchtime - sometimes I manage more. With the views and the countryside, motivation is easy to come by and the brisk winter mornings make it pure pleasure.

My buddy didn't keep up her role and I didn't keep her at it. I think we needed to have regular contact times prearranged in our diaries so that we ensured we'd stay on track. My living circumstances changed and I didn't adjust my exercise program to fit and if we'd been keeping in touch I would have been more likely to do this.

Since running has not been a major goal of mine, I feel that testing has not taken into account just how much I have progressed in a year. I have increased all my major lifts by significant amounts, accomplished all my goals set last year in terms of lifting and have set new goals and am on my way to accomplishing those as well. However my running times will probably end up going in the wrong direction.

As above, the pregnancy. The first trimester was really hard so couldn't do what I had been doing. But now I'm in the second trimester most days I'm doing 30 mins light to moderate intensity. Thank you very much for your support! Good luck

I get sick easily and it take about a month to recover. It affects my breathing so I can't do vigorous activity while I am sick or recovering... These breaks can interrupt my progress and slow me down.

I lost enthusiasm about increasing my fitness about half way through - I think it was at the 3rd test- when test showed I hadn't run any further than the previous test, despite having put in more effort. This result was possibly due to a faulty reading but I felt that this didn't really matter too much. Positive side of this programme is that because of it I did get out running again, and biking and yoga - I don't think I'd have got back into these things unless I'd done the programme - I'd still be thinking about doing them! Think I probably should have chosen a buddy who would also have come running with me - the one I chose was good and encouraged me to get out, but I think someone who I actually ran with would have been more motivating for me. Also, with me leaving Chch, and therefore my buddy, the buddy bond decreased. Am glad I've been part of this program me - thanks very much for the opportunity

Health scare of high blood pressure, over the last year this has lowered. Thank you

I have had many years of yo yo dieting, and my life has always been focussed on weight. My focus has now changed to fitness, and this has taken the pressure off the fear of diet failure. I am doing exercise to improve my fitness, not for weight loss. I can be fat and fitter, and this programme has made this clear to me (the weight loss will come as I become fitter as a consequence and not a focus/goal). Thanks for caring David and helping put me on the right track.

In the beginning the program motivated me to think about what "sport" I would do in winter. This was solved as I went twice a day up the hill with 8 to 9 kilos of food, because the horse needed it. Later I forgot about the program and I guess so did my buddy. Sorry. I am also sorry that the answers about how much I am sitting or lying are very incorrect. It is just a guess. I would have liked to record that precisely for a week. The tests were not clear to me and the results did not make any sense. So I do not know if I have improved or not. That would be kind of nice to know. There was no significant life event this year.

I noticed that when my buddy stopped chasing me up I became more slack about exercising. I've found it really valuable, thank you

Over the last eight months while being pregnant this program has helped me focus on keeping fit through challenging experiences.

My buddy was fully supportive of this programme for the first 4-5 months which placed me in a good habitual position. Once her situation re work changed her contact with me changed also however I felt that I didn't need it so much anymore. It decreased to nothing. After 2 months no contact I was starting to lax so linked back in with my buddy for me to be accountable to her again. Eventually (the last 2months) I didn't need her at all.

My [REDACTED] (motivational partner) and [REDACTED], so all of the comments made in regard to "support" are descriptive of the situation before [REDACTED] (roughly 1/2 to 3/4 in). As I have five major exams in a fortnight and have recently recovered from [REDACTED], my "past four weeks" has taken this into account. The morning I rang in to volunteer for this experiment, I was suffering from a depressive episode and read somewhere that exercise helps. I took the plunge and thought 'why not?' The active lifestyle I was inspired to adopt as a result in participating in this experiment has basically 'cured' a depressive illness I have been battling with for nearly a decade, where medication has failed, so I am very happy and grateful. The benefits of this have entered other areas of my life, including academic achievement. I feel as though I am overall a happier and stronger person.

CONTROL GROUP Exit Survey responses

Q1 What changes (if any) did you make in your day-to-day life as a result of the programme?

- 1 Went out to gym more regularly, knowing adults need to push play like kids for 30-60 mins. Encouraged friends to walk with me.
- 2 I established a regular running scheme that has boosted my ability massively.
- 3 Went to the gym more and got into running outside. Walking short distances instead of driving. Making routines and following them.
- 4 Personal responsibility to do some movement during the day.
- 5
- 6 Started off making changes with a definite exercise schedule, dropped off pretty quickly, no change by now
- 7 Ran more regularly - but have struggled enormously in last few months with onset of winter - cold, dark and bugs - more excuses!
- 8 I am trying more activities in general, and to incorporate even walking into my day-to-day life. I have been able to go tramping with mates more, and I have been able to take the stairs and try more.
- 9 Made a conscious effort to try to incorporate more exercise into my day particularly since I moved overseas
- 10 I had set times to go to the gym, attended some gym classes regularly, and set goals for myself to run
- 11 none sorry as I didn't put the effort in
- 12 As a result of many things i.e. change in job, social situation, freeing up of time after study etc. I have been able to get more physical activity in to my days and a lot of this has been through 'missions' tramping, 100km walk, Heaph track etc. I note these are all experiences outdoors and shared with others. I have been going to back to the gym once a week too which is an improvment. Direction not perfection!
- 13 A part of a number of things I have been doing to better my health and fitness, i am definitely fitter and healthier than I was a year ago.
- 14 I finally incorporated exercise into my daily life so that I can appreciate the benefits of it and not see it as a task.
- 15 I made it a routine to go to the gym at least 5 days a week. I would leave it till late in the evening [initially because I did not want to encounter a gym full of fit people]. This worked well for my body clock....I slept brilliantly and the late-in-the-day exercise refreshed me and gave me a good appetite for dinner. This whole programme convinced me of the benefits of exercise. I cannot think of anything else that I could do to give such immediate health and well-being benefits.
- 16 I set some goals to do a biathlon i think, found out injury is what was holding me back, got that sorted which took months, joined a gym, again got injured, so taking it easy.
- 17 Watch what I eat and thinking more about exercise
- 18 None that lasted for any time.
- 19 I started exercising regularly
- 20 Designed, built upon, and carried out physical exercise routines (when in NZ, less so now that I'm back in Japan due to a number of factors). e.g weight training programmes, regularly playing volleyball Setting and evaluating goals. e.g weight, body shape, strength
- 21 Only in the last few months I have been eating better and exercising 3 times a week
- 22 Increased regular exercise. Both in frequency and intensity.
- 23 I have made exercise an achievable and integral part of my day, e.g. walking to and from work and going for a walk at lunchtime, or doing squats in the kitchen while dinner is cooking. I have changed my approach from an all or nothing exercise regime to shorter and more frequent blocks of walking and exercises that utilise my own body weight and enhance my range of motion.
- 24 Wasn't quite involved with the programme as I should be
- 25 I don't think I changed that at all because I enjoy exercise and being fit.
- 26 - Increasing more incidental activity - Being more mindful of how I get from a to b, e.g. walking or biking instead of driving - Choosing healthier eating options
- 27 Walked more!
I began to use exercise to relax. I believe exercise is a great outlet from sitting in an office all day. I have also [redacted] and this has made a great difference. I have also used some of the discussion with David B to motivate me further. I have invested in jogging equipment as I have met minor milestones e.g. made it to the peak of certain hills etc. I have also entered in events ([redacted] half marathon) to increase my motivation. I don't believe I could have changed as much as I have if I remained in Christchurch at university with [redacted]. The move to Wellington, [redacted] and getting a new job has put a fire cracker up my bottom. I now love to run. I run for pleasure and enjoy the physical benefits it provides. I am achievement focused in all aspects of life and this is fundamental (as it seems) to the continuation of my training (e.g. more and new hills to climb).
- 28 sought out more team-based exercise to keep me motivated. Tried to keep exercise as part of my daily routine even when very busy.

Q2 What did you learn during this program that you can use in the future?

1 Feedback is motivation, results etc.

2 I have found that on the days where I don't want to exercise, I get the highest boost from actually doing something. So I have found it important to really just DO it rather than THINK about it, because that helps me get to where I want to be.

3 How to set goals and follow them to the best of my ability. Learning that having one day where I don't go to the gym when I'm meant to or don't eat as well as I should shouldn't affect what I do the next day.

4 various types of exercising that help. Setting appropriate goals to meet and what limits achieving these

5

6 It'll be easier starting again in the future I think, learnt the importance of involving other people

7 It's ok to make time for myself to exercise in the weekends.

8 1. I have been able to participate more in activities that I was becoming intimidated/afraid to do like tramping or going to a yoga class. 2. I have been able to see that I can maintain low/moderate fitness despite some stress and difficulties, but that it is still very hard for me to continue going when work stress and other problems become immense.

9 I need to try plan exercise activities better when I am busy and working so I can exercise 3-5 times a week more often

10 To prioritise exercise to make sure it gets done, and to enlist the help of supporters

11 didn't learn anything because i didn't follow the programme

12 Things will get better. Was great to have a reminder every now and again that my physical health was important and I needed to be reminded of that. Though I'm not still exercising as much as I want to be I am much more confident that I am on that path and I think this program, although for me not intense in terms of time, was a great reminder when I did have to think about it to keep working towards it small steps at a time though it may be.

13 not sure

14 I can do it, it might just take a little bit of time to work out how!

15 I really resisted doing any exercise until I good no longer put it off. It took about 2-3 weeks before I started to look forward to it. Earlier than that though I found that it made me more alert, fitter, sleep better and very interestingly I felt my memory improved. The physical 'shape change' in my body was good for my ego but the considerable 'brain' benefits were quite unexpected....and thrilling. More should be made of these advantages when promoting exercise. I also learnt that I could change my habits within a short period...say 3 weeks..... and could set modest goals and achieve them with ease.

16 I learnt that exercise has 0% to do with weight control. (or my health, infact, exerting myself made it worst) And that I have a hormonal imbalance, effecting my health.

17 About not pushing myself too much too soon - remembering I am not 19 anymore and that I need to work up to a certain level of exercise rather than jumping in the deep end straight away.

18 That a range of factors affect our motivation to exercise.

19 that i feel better when regularly exercising and pushing myself to do so

20 That even though I'm older, I can still become/remain fit & healthy. Also, I don't necessarily have to go to the gym to become fit & healthy. Doing things such as walking/hiking can be very beneficial to my health. Establishing & carrying out physical exercise routines is also very helpful in becoming fit & healthy.

21 That energy creates energy and you just have to get up and move in order to feel more energised. Energy isn't going to magically appear.

22 That waiting to start until 'next Monday' isn't necessary - do something today.

23 That it is important to listen to your body and let it rest when it needs to - this in turn keeps motivation levels up. Exercise is now a habitual part of the day and I know that I cannot function properly in a sedentary job because I am a person that needs to move throughout the day. The programme affirmed for me that exercise is a key to stimulating mood and that when I feel my most lethargic from my sedentary job then this is the time to do some exercise. Getting my heart rate up and moving about at a fast pace helps me to prioritise my tasks and become more productive in my work and home life.

24 Wasn't quite involved with the programme as I should be so I don't think I learnt much

25 This programme has allowed me to see how I have changed my exercise routines over the past 12 months

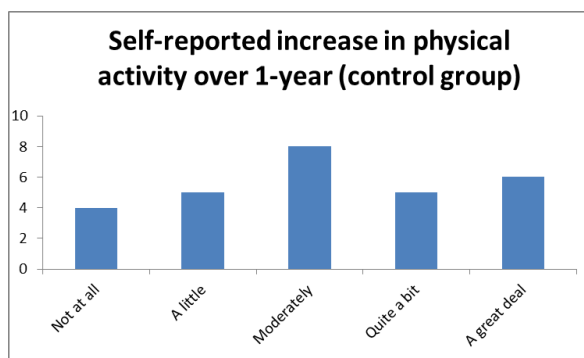
26 - exercise does not have to be hard core for hrs on end - small amounts frequently are just as beneficial and more practical or easier to carry out

27 Do it every day, even if you don't feel like it

Don't sit around, get out that door and get into it. There is no time like the present. Running and physical exercise is great for having a good body and feeling full of life. A person who is fit I beleive is happier. I know this holds for myself. Everything a person does in life is connected and regular phsical exercise positively impacts everything else. People have a greater respect for those that are fit and healthy. Furthermore, to respect others you must first repsect yourself and similiarly, if you respect yourself others will respect you.

28 exercise is very important in many aspects of your life i.e. to keep stress to a minimum, help stay healthy and happy

Q3 Over the last 12-months, how much have you increased and maintained your overall levels of leisure-time and/or transport-related physical



Q4 Please make any further comments you like on any aspect of your experience with the programme? Please mention if any significant life-event influenced your participation in the programme and if so how.
 An SMS option to report results more frequently would be handy, and any result is a good result (feedback).
 With a graph of the results online would be awesome, also interesting to see others results to compete with.

I was majorly motovated by [redacted] teams going to [redacted] with me in training nearly every day.

Would have been good to have more meetings, only had a couple right at the start

I completed my phd in [redacted] and I [redacted] over the last 6 months. So in general I stopped my regular fitness sometime around midJan/Feb and havent been able to get fully back onto (3-4 times per week) kind of schedule, but still more than prior to the study (atleast once or twice per week).

I really appreciated this programme to help me recognise some barriers that I had and once I realised what they were I could take steps to overcome them. Unfortunately a knee injury in October led to a setback in my goals, then getting glandular fever in late April has meant that I have done very little physical activity for nearly 2 months. I have recently been off work so my answers about physical activity in the last 7 days do not reflect my usual routine (I usually cycle to work, etc).

I had a really tough last 18 months physically, emotionally, mentally and socially. It's good to be coming to the end of that and to be engaging more in physical activity that helps support me in all those other areas also. When I started a year ago I can see now I was quite depressed and every day would spend some amount of time in tears. Sleep was bad, confidence was low etc etc. This has changed around and though I have some other physical ailments cropping up I am so much better than when I was a year ago. I've probably put on weight and I may run slower but I am much lighter in spirit and that's priceless. So thanks for putting the effort in to all of your participants because it doesn't have to be much to have a positive ripple effect. :)

Im so happy I made the move to be involved in this programme. I think its fantastic and could benefit so many people in the future. I think one of the main motivating factors for me was the follow up emails every few months. These emails planted that wee motivating seed in my brain and in the end I finally achieved my goal.

The 'significant' motivating life event to do more excercise was to improve one leg that was badly hurt in the first earthquake in Christchurch. Following that though I felt that it would help me to slow down the effects of aging and generally improve my physique....all of which seem to have happened!!

I'm fairly sure I fractured a rib doing zumba, LOL. (a hairline fracture) I told my trainer, i wasn't doing boot camp anymore...the above reason, that it was not working out for weight loss (which i charted on a graph and measured and controlled calories very religiously for a year) I intend to check myself for carb sensitivits and other food reactions.

Was doing well - moved to [redacted] and was cycling 9km's every day to work. Health was definitely improving, was losing weight and feeling a lot better about life. Unfortunately on December 18th I was hit by a car when cycling home from work and since then have not worked as I have a fractured pelvis. I can't walk very far or ride my bike yet. I am doing 1 hour of pilates each week as rehab at the moment and hope to get back to cycling soon. I will start swimming this week as part of rehab too. So was doing well and then have had a backwards mishap. Weight is still being lost though as am on Jenny Craig and so despite not exercising much at the moment I am still losing weight which is good.

I am left wondering what your research has concluded. Having talked to family and friends about how and

19 why they exercise, it seems we all need fairly major life changes (e.g a health scare, a new exercise buddy, a
 20 change of city or job) to motivate any real change in exercise habits.

21 The chance to take part in this survey fell at a very opportune time for me (I'd just returned to Chch & I'd
 22 already made the conscious decision to get fit & healthy so seeing the ad. to take part in this survey posted
 around C.O.E campus further ignited my will/desire to get fit), & I think it helped reinforce, or made things
 that I needed to do explicit for me to get back on the 'physical activity' horse/wagon, after being off it for
 more than 10 years! Cheers!

23 Enjoyed the interviews and Cooper tests. Found the questionnaires a little tricky sometimes - hard to work
 out in minutes how long I sit for during the day etc.

24 The past year has been interesting - I have changed careers, [REDACTED]. I have experienced discomfort in my
 stomach and am undergoing tests. Overall, I have not achieved the fitness goals I set because they were
 unrealistic and unachievable based on the time and stressors in my life. I now have a much healthier attitude
 to fitness in that I don't let it dictate my schedule but make it an integral and enjoyable part of my day.

25 I had goals such as to make the [REDACTED] team but took so long to get off my
 26 arse to do rehab for injuries and get fit. Once I saw the signs of depression I started going. It's hard when
 you get a cold and you're away from exercising, you just want to jump up and play touch or go gym. Harder
 now to get back into it

27 I participated in this programme because I am interested in exercise and wanted to do something that would
 aid research.

28 Particularly enjoyed the motivational sessions! Some of the techniques will be useful to employ in my work
 in the future.

I reached a significant threshold of weight! I made it to about 98kilo. My family noticed as did my friends. I
 felt disgusting, I found breathing hard at night. I could not manage too much exercise. I was generally
 disgusted with myself. It became a vicious cycle as I began to eat more as I felt worse. Almost like I was
 punishing myself further for letting myself become like that. I am unsure if the programme has been the
 main contributor to my success (I believe, as discussed with David B prior to my move, the move would be
 beneficial to the cause). That being said, the programme certainly added fuel to the fire and certainly did
 contribute in some way. Therefore, I conclude the programme in conjunction with my personal life changes
 have both contributed to my success. My initial target was 85 kilo. I am now going for 80. However, other
 targets such as marathons and other events are on my goal list! Thanks David B, appreciate the time you
 took with me. I will not forget the things I have learnt about myself. I look forward to the future. Best of
 luck with the completion of your research and your thesis. [REDACTED]

over the past 4-8 weeks I have been quite sick so not sure if this influences your results but I have not been
 able to participate in my usual routines of exercise.

13 **Appendix E**

1. Systematic review data extraction tables: reviews
2. Systematic review data extraction tables: primary
3. Search strategy

13.1 Data extraction tables: Reviews

Citation	Achterberg, T. v., G. G. J. Huisman-de Waal, et al. (2011). "How to promote healthy behaviours in patients? An overview of evidence for behaviour change techniques." <i>Health Promotion International</i> 26(2): 148-162.
Level of evidence	Level I (Review of reviews)
Country	The Netherlands
Objective	To identify the evidence for the effectiveness of behaviour change techniques, when used by health-care professionals, in accomplishing health-promoting behaviours in patients as described in systematic reviews.
Study type/design	Systematic review of 23 systematic reviews which included 210 studies and 88% of the studies included in the reviews were RCTs.
Search strategy	Systematic reviews were retrieved by systematically searching Pubmed, CINAHL, PsycInfo and the Cochrane Database of Systematic Reviews. Search strategies for each topic (smoking, diet, exercise) and each database included both relevant index terms and free text words.
Type of included studies	Selection of RCTs within the reviews (50% of the studies) focussing on smoking, exercise or diet. As many reviews were sufficiently systematic and provided detailed descriptions of studies included, these tables and appendices on studies included in the reviews were used to gain data at the level of studies. The search strategies, the selection process and the process of quality assessment therefore focused on systematic reviews, whereas the data extraction focused on individual studies within these reviews.
Types of participants	Patients were defined as all who were diagnosed with physical or mental diseases and/or who were recruited through contacts with healthcare providers. Focussing on adults (18 years of age and over)
Type of intervention	All interventions for promoting healthy behaviours. Studies needed to provide sufficient clarity on intervention content by offering a description of what was targeted (e.g. knowledge, attitude, social support, facilities, etc.) and how (for instance through education, feedback, peer influence financial rewards, etc). The taxonomy of behavioural change techniques described by Abraham and Michie, (2008) was used to relate descriptions of intervention content to definitions of behaviour change techniques.
Outcomes	Behavioural outcome assessments (such as smoking behaviour, physical exercise or food intake) at any length of follow-up.
Data analyses & statistics	A descriptive analysis to report the frequency of use of behaviour change techniques and the information on effectiveness. Data was analysed for effectiveness at both: (i) the level of the main categories within the classification (e.g. knowledge-directed techniques, techniques targeting awareness, etc.) and (ii) the level of specific techniques. The quality of the systematic reviews was assessed using the quality assessment tool developed by Oxman (Oxman, 1994). Reviews of very low quality (scores 1 and 2 out of 7) were excluded and all reviews of moderate to high quality (3 and higher) were included.
Citations of included studies	The final selection based on full text resulted in a total number of 23 systematic reviews: 14 on smoking cessation Windsor, R. A., Boyd, N. R. and Orleans, C. T. (1998) A meta-evaluation of smoking cessation intervention research among pregnant women: improving the science and art. <i>Health Education Research</i> , 13, 419–438 Revere, D. and Dunbar, P. J. (2001) Review of computer generated outpatient health behavior interventions: clinical encounters in absentia. <i>Journal of the American Medical Informatics Association</i> , 8, 62–79. van der Meer, R. M., Wagena, E. J., Ostelo, R. W., Jacobs, J. E. and van Schayck, C. P. (2001) Smoking cessation for chronic obstructive pulmonary disease. <i>Cochrane Database of Systematic Reviews</i> , CD002999. Blenkinsopp, A., Anderson, C. and Armstrong, M. (2003) Systematic review of the effectiveness of community pharmacy-based interventions to reduce risk behaviours and risk factors for coronary heart disease. <i>Journal of Public Health Medicine</i> , 25, 144–153 Lumley, J., Oliver, S. S., Chamberlain, C. and Oakley, L. (2004) Interventions for promoting smoking cessation during pregnancy. <i>Cochrane Database of Systematic Reviews</i> , CD001055. Sinclair, H. K., Bond, C. M. and Stead, L. F. (2004) Community pharmacy personnel interventions for smoking cessation. <i>Cochrane Database of Systematic Reviews</i> , CD003698. Lancaster, T. and Stead, L. F. (2005) Individual behavioural counselling for smoking cessation. <i>Cochrane Database of Systematic Reviews</i> , CD001292. Rice, V. H. and Stead, L. (2006) Nursing intervention and smoking cessation: meta-analysis update. <i>Heart Lung</i> , 35, 147–163. Rigotti, N. A., Munafo, M. R. and Stead, L. F. (2007) Interventions for smoking cessation

	<p>in hospitalised patients. Cochrane Database of Systematic Reviews, CD001837.</p> <p>Barth, J., Critchley, J. and Bengel, J. (2008) Psychosocial interventions for smoking cessation in patients with coronary heart disease. Cochrane Database of Systematic Reviews, CD006886.</p> <p>Naughton, F., Prevost, A. T. and Sutton, S. (2008) Self-help smoking cessation interventions in pregnancy: a systematic review and meta-analysis. <i>Addiction</i>, 103, 566–579.</p> <p>Rice, V. H. and Stead, L. F. (2008) Nursing interventions for smoking cessation. Cochrane Database of Systematic Reviews, CD001188.</p> <p>Stead, L. F., Bergson, G. and Lancaster, T. (2008) Physician advice for smoking cessation. Cochrane Database of Systematic Reviews, CD000165.</p> <p>Zaki, A., Abrishami, A., Wong, J. and Chung, F. F. (2008) [Interventions in the preoperative clinic for long term smoking cessation: a quantitative systematic review]. <i>Canadian Journal of Anaesthesia</i>, 55, 11– 21.</p> <p>6 on exercise promotion</p> <p>Eakin, E. G., Glasgow, R. E. and Riley, K. M. (2000) Review of primary care-based physical activity intervention studies: effectiveness and implications for practice and future research. <i>The Journal of Family Practice</i>, 49, 158–168.</p> <p>Pinto, B. M., Eakin, E. and Maruyama, N. C. (2000) Health behavior changes after a cancer diagnosis: what do we know and where do we go from here? <i>Annals of Behavioral Medicine</i>, 22, 38–52.</p> <p>Lawlor, D. A. and Hanratty, B. (2001) The effect of physical activity advice given in routine primary care consultations: a systematic review. <i>Journal of Public Health Medicine</i>, 23, 219–226.</p> <p>Eden, K. B., Orleans, C. T., Mulrow, C. D., Pender, N. J. and Teutsch, S. M. (2002) Does counselling by clinicians improve physical activity? A summary of the evidence for the U.S. Preventive Services Task Force. <i>Annals of Internal Medicine</i>, 137, 208– 215</p> <p>Levack, W. M., Taylor, K., Siegert, R. J., Dean, S. G., McPherson, K. M. and Weatherall, M. (2006) Is goal planning in rehabilitation effective? A systematic review. <i>Clinical Rehabilitation</i>, 20, 739–755.</p> <p>Hudon, C., Fortin, M. and Soubhi, H. (2008) Single risk factor interventions to promote physical activity among patients with chronic diseases: systematic review. <i>Canadian Family Physician</i>, 54, 1130– 1137.</p> <p>2 on healthy diets</p> <p>Thompson, R. L., Summerbell, C. D., Hooper, L., Higgins, J. P., Little, P. S., Talbot, D. et al. (2003) Dietary advice given by a dietician versus other health professional or self-help resources to reduce blood cholesterol. Cochrane Database of Systematic Reviews, CD001366.</p> <p>Nield, L., Summerbell, C. D., Hooper, L., Whittaker, V. and Moore, H. (2008) Dietary advice for the prevention of type 2 diabetes mellitus in adults. Cochrane Database of Systematic Reviews, CD005102.</p> <p>1 on both exercise and diets</p> <p>Wilcox, S., Parra-Medina, D., Thompson-Robinson, M. and Will, J. (2001) Nutrition and physical activity interventions to reduce cardiovascular disease risk in health care settings: a quantitative review with a focus on women. <i>Nutrition Review</i>, 59, 197–214.</p>															
*Review quality See below for “A-G” quality criteria questions†	<p>A (2) Adequate/Reported: The aim/scope of the review was well defined.</p> <p>B (2) Adequate/Reported: Search strategy used included/described.</p> <p>C (2) Adequate/Reported: Inclusion criteria appropriate/un-biased.</p> <p>D (2) Adequate/Reported: The authors reported in detail on the quality assessment methodology.</p> <p>E (2) Adequate/Reported: The results of the individual studies were appropriately summarised by narrative.</p> <p>F (2) Adequate/Reported: Yes, appropriate statistical methods used.</p> <p>G (1) Adequate/Reported: N/A.</p>															
	<p>‡§TOTAL: 13 points; Good.</p>															
Results (relevant to scope of current review)	<p>The search resulted in 3764 hits and finally 26 reviews met inclusion criteria. Taken together, the reviews included 210 studies with intervention elements focusing on patients’ knowledge, 68 studies on awareness, 13 on social influence, 48 on attitudes, 40 on self-efficacy, 50 on intentions, 9 on action control, 26 on maintenance, 173 on facilitating behaviour and 143 studies where one or more intervention elements were unclear.</p> <table><tr><td colspan="2">Techniques addressed</td><td colspan="3">All studies within the reviews [% studies with sign pos effects (n)]</td></tr><tr><td></td><td>Smoking</td><td>Exercise</td><td>Diet</td><td>All health behaviours</td></tr><tr><td>Social influence*</td><td>33 (9)</td><td>100 (1)</td><td>67 (3)</td><td>53 (13)</td></tr></table> <p>*Plan social support or social change (social support theories): Prompting</p>	Techniques addressed		All studies within the reviews [% studies with sign pos effects (n)]				Smoking	Exercise	Diet	All health behaviours	Social influence*	33 (9)	100 (1)	67 (3)	53 (13)
Techniques addressed		All studies within the reviews [% studies with sign pos effects (n)]														
	Smoking	Exercise	Diet	All health behaviours												
Social influence*	33 (9)	100 (1)	67 (3)	53 (13)												

	<p>consideration of how others could change their behaviour to offer the person help or (instrumental) social support, including “buddy” systems and/or providing social support.</p> <p>From: Abraham and Michie’s taxonomy of behaviour change techniques– Abraham, C. and S. Michie (2008). "A taxonomy of behavior change techniques used in interventions." <i>Health Psychol</i> 27(3): 379-387.</p> <p>A first finding is that none of the groups of techniques seem to consistently demonstrate statistically significant positive effects (e.g. 36% of studies found positive effects of knowledge strategies) whereas high success percentages were mostly found with techniques, which were not very often studied (e.g. 67% of only nine studies on action control techniques reported behaviour change effects).</p> <p>The numbers of studies with significantly positive results were highest for the awareness directed techniques self-monitoring of behaviour (56%) and risk communication (52%) whereas the intention directed strategy use of social support (50%) was almost as successful. Relatively high percentages of successful studies were also found for the attitude technique reinforcement on behavioural progress (46%), the self-efficacy technique of planning coping responses (45%) and the intention technique specific goal setting (42%).</p> <p>Another finding is that the evidence from smoking cessation research largely differs from the evidence for the other two health topics. Some techniques were (almost) only studied in smoking cessation research (re-evaluation of outcomes, persuasive communication, reinforcement on behavioural progress, planning coping responses, use of social support). With other techniques results were different and often more positive in studies on exercise and diet.</p>
Authors’ conclusions	Self-monitoring of behaviour, risk communication, and use of social support were most often identified as effective. The frequently used knowledge and facilitation techniques were clearly less often effective.
Reviewers notes	This comprehensive review of reviews reports data pertaining to the effectiveness of behaviour change techniques across smoking, diet and exercise.
Relevance to study question	This study is relevant to inform both interventions with patients as well as the training strategies that might be most helpful when trying to enhance support/buddy relationships. For example, if knowledge techniques are not particularly effective with patients then it is likely that they may not be particularly effective with buddies either.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

‡ For each individual answer, the following scores were assigned:

†The quality of systematic reviews was assessed using the following questions:

- (A) Was a clinical question clearly defined?
- (B) Was an adequate search strategy used?
- (C) Were the inclusion criteria appropriate and applied in an unbiased way?
- (D) Was a quality assessment of included studies undertaken?
- (E) Were the characteristics and results of the individual studies appropriately summarised?
- (F) Were the methods for pooling the data appropriate?
- (G) Were sources of heterogeneity explored?

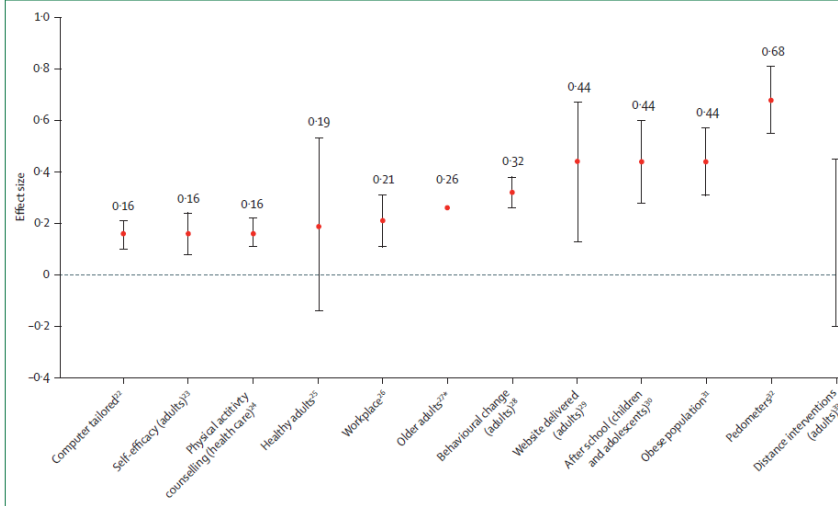
Adequate/reported = 2
Inadequate = 1
Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

- An overall study score of 1-4 is rated Poor
- An overall study score of 5-10 is rated Fair
- An overall study score of 11-14 is rated Good

Abbreviations: RCT = randomised controlled trial

Citation	Heath, G. W., D. C. Parra, et al. (2012). "Evidence-based intervention in physical activity: lessons from around the world." <i>Lancet</i> 380(9838): 272-281.		
Level of evidence	I		
Country	USA		
Objective	To search and review previous reviews of physical activity interventions, published between 2000 and 2011, and identify effective, promising, or emerging interventions from around the world.		
Study type/design	Systematic review of reviews		
Search strategy	Searched the Database of Abstracts of Reviews of Effects (DARE), the Cochrane library, TRIP, PubMed (Medline), the American Psychological Association, National Guidelines Clearing house, and the System for Information on Grey Literature in Europe (SIGLE; OpenGrey) for systematic reviews of physical activity interventions in any language.		
Type of included studies	Systematic reviews of experimental studies		
Types of participants	Children, adolescents, or adults without established disease		
Type of intervention	Interventions that involved at least one of the three domains (1) Campaigns and informational approaches, (2) behavioural/social approaches, (3) environmental and policy approaches; studied in children, adolescents, or adults without established disease; interventions that lasted 3 months or longer; had a detailed study protocol; and had at least one measure for physical activity outcomes. Further, emerging intervention strategies have been assessed, peer-reviewed, and reported, but are so new that they have not yet been incorporated into systematic evidence reviews.		
Outcomes	Any measure for physical activity outcome		
Data analyses & statistics	The effect-size estimates (mean net percentage change calculated with data from our review of reviews) provided the opportunity to separate out estimates for several different settings (eg, workplaces), populations (eg, older adults), or intervention types.		
Citations of included studies	No citation list included, only review citations 'in-text' and summary provided (below).		
	Setting/context	Number of reviews	Type of reviews
	School	5	3 narrative; 1 review of reviews; 1 meta-analysis
	Workplace	5	4 narrative; 1 meta-analysis
	Community	14	12 narrative; 1 review of reviews; 1 meta-analysis
	Clinical or primary care	18	17 narrative; 1 meta-analysis
	Several settings	58	40 narrative; 3 reviews of reviews; 15 meta-analyses
	Total	100	76 narrative; 5 reviews of reviews; 19 meta-analyses
*Review quality See below for "A-G" quality criteria questions†	A (2) Adequate/Reported		
	B (2) Adequate/Reported: Search strategy used included/described		
	C (2) Adequate/Reported: Inclusion criteria appropriate/un-biased.		
	D (2) Adequate/Reported: The authors reported in detail on the quality assessment methodology		
	E (1) Inadequate: The results of the individual studies were not all presented		
	F (2) Adequate/Reported: Yes, appropriate statistical methods used		
	G (2) Adequate/Reported		
	‡§TOTAL: 13 points; Good.		
Results (relevant to scope of current review)	<p>The total number of merged records in all datasets was 1547, of which 100 reviews met the criteria for inclusion.</p> <p>Behavioural and social approaches Individually adapted programmes to change health behaviour are characterised by a multi-component intervention approach, and aim to have participants incorporate physical activity into their daily routines.</p> <p>Goal setting, social support, and behavioural reinforcement through self-reward, structured problem solving, and relapse prevention are examples of this type of intervention. Such programmes can be delivered in group settings or by email, internet, mail, or telephone, or by all four means. Interventions that are focused on the individual usually consist of an assessment of a participant's physical activity and readiness to change, a tailored activity plan, and identification of community interventions through a centralised health provider or promoter. This approach, which focuses on lifestyle physical activity, is cost-effective when compared with supervised physical activity programmes.</p> <p>Social support in community settings is an example of a strategy that capitalises on social networks to reinforce physical activity behaviour. Behavioural and social approaches include creation of buddy systems, behavioural contracts between the participant and programme leaders, and formation of</p>		

	<p>walking or other physical activity support groups.</p> <p>Provider-based physical activity counselling has undergone systematic review, and sufficient evidence is still not available to allow its recommendation as a single component intervention. However, this approach has promising results when integrated into existing community efforts.</p>  <p>Mean effect-size estimates from original systematic reviews All are mean effect size and 95% CIs, unless otherwise indicated. *Index. †Range.</p> <p>Key messages</p> <ul style="list-style-type: none"> • Initiatives to promote physical activity can have increased effectiveness when health agencies form partnerships and coordinate efforts with several other organisations: schools; businesses; policy, advocacy, nutrition, recreation, planning, and transport agencies; and health-care organisations • Effective public communication and informational approaches promoting physical activity include community-wide campaigns, mass media campaigns, and decision prompts encouraging the use of stairs versus lifts and escalators • Initiatives to increase social support for physical activity within communities, specific neighbourhoods, and worksites can effectively promote physical activity • Comprehensive school-based strategies encompassing physical education, classroom activities, after-school sports, and active transport can increase physical activity in young people • Environmental and policy approaches can create or enhance access to places for physical activity with outreach activities; infrastructural initiatives through urban design of land use and planning at community and street scales and active transport policy and practices are effective • To properly support initiatives for the promotion of physical activity, workforces need to be trained in physical activity and health, core public health disciplines, and methods of intersectoral collaboration • Although individuals need to be informed and motivated to adopt physical activity, the public health priority should be to ensure that environments are safe and supportive of health and wellbeing
Authors' conclusions	Behavioural and social approaches are effective, introducing social support for physical activity within communities and worksites, and school-based strategies that encompass physical education, classroom activities, after-school sports, and active transport.
Reviewers notes	A very comprehensive review: although the depth of reporting suffers as a result of the very broad scope of the review and the resultant high number of included studies.
Relevance to study question	Yes. Includes initiatives to increase social support for physical activity within communities including buddy-systems. Reports on the relatively small effect size of studies conducted with healthy adults generally.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of systematic reviews was assessed using the following questions:

- (A) Was a clinical question clearly defined?
- (B) Was an adequate search strategy used?
- (C) Were the inclusion criteria appropriate and applied in an unbiased way?
- (D) Was a quality assessment of included studies undertaken?
- (E) Were the characteristics and results of the individual studies appropriately summarised?
- (F) Were the methods for pooling the data appropriate?
- (G) Were sources of heterogeneity explored?

Abbreviations: RCT = randomised controlled trial

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Citation	Conn, V. S., A. R. Hafdahl, et al. (2011). "Interventions to Increase Physical Activity Among Healthy Adults: Meta-Analysis of Outcomes." American Journal of Public Health 101(4): 751-758.
Level of evidence	Level I
Country	USA
Objective	A meta-analysis summarising the effects of interventions designed to increase physical activity among healthy adults: addressed 2 questions: (1) What overall effects do interventions designed to increase physical activity have on physical activity behaviour after completion of interventions? (2) Do interventions' effects on physical activity behaviour vary depending on intervention, methodology, or sample characteristics?
Study type/design	Meta-analysis of 358 trials including 564 pair-wise comparisons.
Search strategy	Databases searched with broad search terms: searches in 13 databases, 36 research registers, ancestry searches for review articles, computerized database searches for senior authors and principal investigators of all eligible studies, hand-searching of 82 journals from 1960 through 2007. This extensive searching yielded 54642 papers to consider for inclusion.
Type of included studies	RCTs and before and after trials: 358 reports were coded a total of 74 intervention characteristics across several categories of intervention content and methods.
Types of participants	In total, 99011 participants were healthy adults median of the mean age was 44 years, with a median of 74% women, but the median for minority participants was only 14% among studies that reported such data.
Type of intervention	Diverse physical activity behaviour change interventions were eligible and a total of 74 intervention characteristics were coded and recorded (including: access enhancement, barriers management, competition, contracting, consequences or rewards, cues or stimulus control, decision making, education about the health benefits of physical activity, exercise prescription, feedback, goal setting, modelling, monitoring physical activity behaviour by research staff, motivational interviewing, problem solving, relapse prevention education, and self-monitoring).
Outcomes	Physical activity: estimates of mean physical activity effect sizes were converted to the original metrics of ambulatory steps per day and minutes per week.
Data analyses & statistics	Extracted data on 564 pair-wise comparisons from 358 reports. Calculated standardized mean difference (d) effect size was calculated for each primary study comparison. Weighting each effect size by the inverse of its sampling variance (i.e., precision). Homogeneity was assessed using a conventional heterogeneity statistic (Q) and I ² . Random-effects analyses to synthesize data, and we used meta-analytic analogues of regression and analysis of variance to examine potential moderator variables. Used a mixed-effects meta-analytic analogue of regression for moderator analyses.
Description of included studies	Individual studies not listed due the very large number of studies reviewed.
*Review quality See below for "A-G" quality criteria questions†	A (2) Adequate/Reported: The aim/scope of the review was well defined. B (2) Adequate/Reported: Search strategy used included/described. C (2) Adequate/Reported: Inclusion criteria appropriate/un-biased. D (0) Not reported
	E (2) Adequate/Reported: The results of the individual studies were appropriately summarised by meta-analysis.
	F (2) Adequate/Reported: Yes, appropriate statistical methods used: random effects model, effect sizes were adjusted by inverse variance weights to control for studies' sample sizes.
	G (2) Adequate/Reported: Yes, Q statistic.
	⌘ TOTAL: 12 points; Good.
Results (relevant to scope of current review)	The overall mean effect size for comparisons of treatment groups versus control groups was 0.19 This effect size is consistent with a mean difference of 496 ambulatory steps per day between treatment and control participants. In contrast, control participants did not experience increased physical activity by participating in studies, as evidenced by a mean effect size of 0.00 (d). Exploratory moderator analyses suggested that the characteristics of the most effective interventions were behavioural interventions instead of cognitive interventions, face-to-face delivery versus mediated interventions (e.g., via telephone or mail), and targeting individuals instead of communities. Moderator analyses findings are summarised below: –Interventions that exclusively used behavioural strategies (0.25) (e.g., goal setting, contracting, self-monitoring, cues, rewards NOT cognitive e.g. decision making, health education, providing information)....a robust finding. –Interventions that targeted entire communities (mass-media interventions and interventions targeting entire communities)(0.09) were less effective than were

	<p>interventions aimed at individuals (0.19).</p> <p>–Studies that did not use social cognitive theory reported significantly larger effect size (0.20) than did studies that used social cognitive theory (0.12).</p> <p>–Studies without the Transtheoretical model reported larger effect size (0.21) than did studies with the model (0.15) (this pattern of findings suggested that social cognitive theory was more detrimental to effect-size values than was the Transtheoretical model).</p> <p>–Interventions that included a train-the-trainer approach were less effective (0.09) than were interventions with research staff providing interventions directly to participants (0.21).</p> <p>–standardized interventions (0.20) were more effective than individually tailored interventions (0.04) (mixed results).</p> <p>–The effect size from these studies of healthy adults is smaller than are the effect size reported for chronically ill adults in previous studies ($d=0.45$) and the effect size reported for chronically ill and healthy adults and children ($d=0.72$).</p> <p>–The presence of chronic illness may cause patients to be more responsive to interventions.</p> <p>–The magnitude of physical activity behaviour change was modest. The achieved steps per day did not meet public health goals of 10000 steps per day.</p> <p>–Behavioural strategies include goal setting, self-monitoring, physical activity behaviour feedback, consequences, exercise prescription, and cues.</p> <p>–Health care providers and public health programs often emphasize physical activity's health benefits, but we found that health education did not increase effect size. Perhaps the public already is convinced of physical activity's health benefits.</p>
Authors' conclusions	<p>–The 2-group comparison mean effect size of 0.19 is consistent with a mean difference of 14.7 minutes per week of physical activity or 496 steps per day between the treatment and control groups. If we assume true effect sizes are normally distributed with a mean of 0.19 and a standard deviation of 0.17, then the middle 95% of true effect sizes falls between –0.14 and 0.53. Expressing this interval in an original metric gives (–11.0–40.3) minutes per week or (–371–1363) steps per day. Thus, for instance, a randomly selected study's true mean difference for treatment participants could plausibly range from 11 minutes per week less to about 40 minutes per week more.</p> <p>–The results of the moderator analyses should be used to interpret findings, and these effect-size comparisons may be more important than the overall effect size.</p> <p>–These findings suggest that interventions to increase physical activity should emphasize behavioural components such as self-monitoring, stimuli to increase physical activity, rewards, behavioural goal setting, and modelling physical activity behaviour in standardized interventions delivered to individuals face-to-face.</p>
Reviewers notes	A very large meta-analysis of physical activity interventions in healthy participants.
Relevance to study question	Reports the effect size for physical activity interventions for healthy participants as well as the moderators that are important to programme success. Does not specifically highlight buddy-systems but does put emphasis on face-to-face delivery and behavioural (over cognitive) strategies.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

‡ For each individual answer, the following scores were assigned:

†The quality of systematic reviews was assessed using the following questions:

- (A) Was a clinical question clearly defined?
- (B) Was an adequate search strategy used?
- (C) Were the inclusion criteria appropriate and applied in an unbiased way?
- (D) Was a quality assessment of included studies undertaken?
- (E) Were the characteristics and results of the individual studies appropriately summarised?
- (F) Were the methods for pooling the data appropriate?
- (G) Were sources of heterogeneity explored?

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Citation	Park Eal, W., et al. (2012) Enhancing partner support to improve smoking cessation. Cochrane Database of Systematic Reviews
Level of evidence	Level I
Country	South Korea/USA
Objective	To determine if an intervention to enhance partner support helps smoking cessation when added as an adjunct to a smoking cessation programme.
Study type/design	Systematic review
Search strategy	Search performed in: Cochrane Tobacco Addiction Group specialized register (Oct 2007), Cochrane controlled trials register (Oct 2007), (1966-Oct 2007), MEDLINE (1966-Oct 2007), EMBASE (1974-Oct 2007), PsycINFO (1861-Oct 2007). The search terms used were smoking (prevention, control, therapy), smoking cessation, and support (family, marriage, spouse, partner, sexual partner, buddy, friend, co-habitees, and co-worker).
Type of included studies	Randomized controlled clinical trials of smoking cessation interventions that compared an intervention that included a partner support component with an otherwise identical intervention, and reported follow up of six months or more.
Types of participants	Smokers
Type of intervention	Interventions designed to enhance partner support for smokers in cessation programmes including spouses, friends, co-workers, 'buddies', or other significant others who supported the smokers as a part of the cessation programme to which they were assigned.
Outcomes	<ul style="list-style-type: none"> – Primary outcome was self-reported abstinence of the smoker (not the partner) or biochemical assessment (carbon monoxide levels, saliva cotinine/thiocyanate), assessed at least six months following the initiation of treatment. – Level of partner support, as assessed by the Partner Interaction Questionnaire (PIQ), or by other methods.
Data analyses & statistics	Estimated a pooled weighted average of risk ratios using the Mantel-Haenszel fixed-effect method, with 95% confidence intervals. The scores of PIQ (partner interaction questionnaire) were also analysed to assess partner support.
Description of included studies	<p>The 11 included studies were published between 1981 and 2006, covering a total of 2172 participants (1048 intervention/ 1124 control). The number of participants per study ranged from 24 to 1003.</p> <p>Included studies</p> <p>Ginsberg D, Hall SM, Rosinski M. Partner support, psychological treatment, and nicotine gum in smoking treatment: an incremental study. <i>International Journal of the Addictions</i> 1992; 27(5):503–14.</p> <p>Glasgow RE, Klesges RC, O'Neill HK. Programming social support for smoking modification: an extension and replication. <i>Addictive Behaviors</i> 1986; 11:453–7.</p> <p>Gruder CL, Mermelstein RJ, Kirkendol S, Hedeker D, Wong SC, Schreckengost J. Effects of social support and relapse prevention training as adjuncts to a televised smoking-cessation intervention. <i>Journal of Consulting and Clinical Psychology</i> 1993; 61(1):113–20.</p> <p>Malott JM, Glasgow RE, O'Neill HK, Klesges RC. Coworker social support in a worksite smoking control program. <i>Journal of Applied Behavior Analysis</i> 1984; 17(4): 485–95.</p> <p>May S, West R, Hajek P, McEwen A, McRobbie H. Randomized controlled trial of a social support ('buddy') intervention for smoking cessation. <i>Patient Education and Counseling</i> 2006; 64:235–41.</p> <p>McBride CM, Baucom DH, Peterson BL, Pollak KI, Palmer C, Westman E, et al. Prenatal and postnatal smoking abstinence. A partner-assisted approach. <i>American Journal of Preventive Medicine</i> 2004; 27(3):232–8.</p> <p>McIntyre-Kingsolver K, Lichtenstein E, Mermelstein RJ. Spouse training in a multicomponent smoking-cessation program. <i>Behavior Therapy</i> 1986; 17:67–74.</p> <p>Nyborg KF, Nevid JS. Couples who smoke: A comparison of couples training versus individual training for smoking cessation. <i>Behavior Therapy</i> 1986a; 17:620–5.</p> <p>Nyborg KF, Nevid JS. Couples who smoke: A comparison of couples training versus individual training for smoking cessation. <i>Behavior Therapy</i> 1986b; 17:620–5.</p> <p>Orleans CT, Schoenbach VJ, Wagner EH, Quade D, Salmon MA, Pearson DC, et al. Self-help quit smoking interventions: effects of self-help materials, social support instructions, and telephone counseling. <i>Journal of Consulting and Clinical Psychology</i> 1991; 59(3):439–48.</p> <p>Patten CA, Petersen LR, Hughes CA, Ebbert JO, Morgenthaler BS, Brockman TA, et al.</p>

	<p>Feasibility of a telephone-based intervention for support persons to help smokers quit: a pilot study. <i>Nicotine & Tobacco Research</i> 2009; 11(4):427–32.</p> <p>Patten CA, Hughes CA, Lopez KN, Thomas JL, Brockman TA, Smith CM, et al. Web-based intervention for adolescent nonsmokers to help parents stop smoking: A pilot feasibility study. <i>Addictive Behaviors</i> 2012; 37(1):85–91.</p> <p>Powell DR, McCann BS. The effects of a multiple treatment program and maintenance procedures on smoking cessation. <i>Preventive Medicine</i> 1981; 10:94–104.</p>
*Review quality See below for “A-G” quality criteria questions†	<p>A (2) Adequate/Reported: The aim/scope or the review was well defined.</p> <p>B (2) Adequate/Reported: Search strategy used included/described.</p> <p>C (2) Adequate/Reported: Inclusion criteria appropriate/un-biased.</p> <p>D (2) Adequate/Reported</p> <p>E (2) Adequate/Reported</p> <p>F (2) Adequate/Reported</p> <p>G (2) Adequate/Reported</p> <p>‡§TOTAL: 11 points; Good.</p>
Results (relevant to scope of current review)	There was no evidence of an effect at either follow-up point: at six to nine months the RR was 0.99 (95% CI 0.84 to 1.15, 13 studies, I ² = 20%, Analysis 1.1) and at 12 months or greater the RR was 1.04 (95% CI 0.87 to 1.24, 6 studies, I ² = 0%, Analysis 1.2).
Authors’ conclusions	These studies suggest that partner support and the absence of partner criticism may be important in smoking cessation, but that these behaviours are not easily changed by the interventions used in these studies.
Background	<p>Several studies have demonstrated that support from the spouse is highly predictive of successful smoking cessation (Graham 1971; Ockene 1982; Coppotelli 1985; Gulliver 1995). In particular, supportive behaviours involving cooperative behaviours, such as talking the smoker out of smoking the cigarette, and reinforcement, such as expressing pleasure at the smoker’s efforts to quit, predict successful quitting (Mermelstein 1983; Coppotelli 1985). Negative behaviours, such as nagging the smoker and complaining about smoking, are predictive of relapse. One study found that supportive behaviours were associated with initial smoking cessation, while negative or critical behaviours were associated with earlier relapse (Roski 1996).</p> <p>Although support from a spouse has been shown to be highly predictive of successful smoking cessation (Graham 1971; Ockene 1982), the literature in this area is somewhat confusing. In a recent review of social support in smoking cessation, Westmaas et al argue that theoretical models need to be developed and tested in order for research on peer and partner social support for smoking cessation to advance (Westmaas 2010).</p> <p>Pre-existing support and partner smoking status need to be controlled for in future studies. Interventions should pay more attention to the quality of the partner interaction and be more effective at increasing partner support.</p>
Relevance to study question	Yes, specifically tests the buddy system in smoking cessation.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

‡ For each individual answer, the following scores were assigned:

†The quality of systematic reviews was assessed using the following questions:

- (A) Was a clinical question clearly defined?
- (B) Was an adequate search strategy used?
- (C) Were the inclusion criteria appropriate and applied in an unbiased way?
- (D) Was a quality assessment of included studies undertaken?
- (E) Were the characteristics and results of the individual studies appropriately summarised?
- (F) Were the methods for pooling the data appropriate?
- (G) Were sources of heterogeneity explored?

Adequate/reported = 2
Inadequate = 1
Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

- An overall study score of 1-4 is rated Poor
- An overall study score of 5-10 is rated Fair
- An overall study score of 11-14 is rated Good

Abbreviations: RCT = randomised controlled trial

Citation	May, S. and R. West (2000) Do social support interventions ("buddy systems") aid smoking cessation: a review (Structured abstract). Tobacco Control 415-422
Level of evidence	Level I
Country	UK
Objective	To provide an overview of the role of social support in smoking cessation and to critically review evidence regarding the use of "buddy systems" (where smokers are specifically provided with someone to support them) to aid smoking cessation.
Study type/design	Systematic review
Search strategy	Searching Medline and PsycLit using the key words "smoking", "smoking cessation", "social support", and "buddy"... from 1980.
Type of included studies	Randomised controlled trials. Ten studies were identified: nine were clinic based smoking trials, eight used a group format.
Types of participants	Smokers who wanted to stop
Type of intervention	Use of a social support intervention, including a "buddy" (either using buddies from among smokers' existing relationships (nine studies) or from within groups (one study). The "buddy" support interventions were of two broad types. The majority were directed support interventions, using populations who identified buddy support before randomisation. These studies therefore made use of pre-existing support structures. They attempted to improve the quality of support with training, drawing on previous research to indicate what is beneficial. Only one study fell into the second category of the initiation of new ties. All the studies involved some level of guidance to buddies and/or smokers regarding how to be supportive. To what extent "support training" was provided varied from intensive group treatments with role playing and rehearsal to a simple instruction to call each other regularly.
Outcomes	Also all but one of the studies reviewed used point prevalence rate of smoking abstinence as their outcome measure. Typically abstinence was defined as no smoking in the previous week for the later follow-ups (participants may relapse following the intervention but stop again using an entirely different method at a later date and be counted as a treatment success).
Data analyses & statistics	Narrative synthesis
Description of included studies	<p>– Albrecht S, Stone CA, Payne L, et al. A preliminary study of the use of peer support in smoking cessation programs for pregnant adolescents. Journal of the American Academy of Nurse Practitioners 1998;10:119–25. –84 pregnant teenagers; half an hour meetings with the nurse about smoking, plus 8 group meetings, plus subject selected buddy to attend all sessions. Buddies were all non-smoking women in same age range. (Note: a preliminary study with follow-up results subsequently reported in 2006).</p> <p>–Ginsberg D, Hall SM, Rosinski M. Partner support, psychological treatment and nicotine gum in smoking treatment: an incremental study. Int J Addictions 1992;27:503–14. 99 smokers, received 2 mg nicotine gum and materials (NG). Additional psychological treatment (NGPT) included relapse prevention, public commitment and cost benefit discussions. Additional partner support (NGPTPS); training for buddy on support strategies, videotape, signed agreements.–Glasgow RE, Klesges RC, O'Neill HK. Programming social support for smoking modification: an extension and replication. Addict Behav 1986;11:453–7. 29 smokers in work site, Controlled smoking (CS): 6 weekly group meetings focused on strategies to support nicotine fading, session 4 subjects decide to quit or not.Social support condition (CSPS) as above plus smokers selected buddy from non-work environment to support out of the office. Buddy came to 2 sessions and were phoned twice by therapist. Both receive biweekly support manual.</p> <p>–Gruder CL, Mermelstein RJ, Kirkendol S, et al. Effects of social support and relapse prevention training as adjuncts to a televised smoking cessation intervention. J Consult Clin Psychol 1993;61:113–20. 50 sites. 793 smokers, Control group (C) received manual and encouraged to watch stop smoking TV programme. In addition, group conditions all met for 3, 90 minute sessions and received 2 follow up calls. All bought non-smoking buddy to second group to meet separately. Discussion group (DG): buddies have general discussion. Social support condition (SS): instruction and role plays on how to get support and offer it. Relapse prevention in last visit and extra manuals. Quit at or after final visit.</p> <p>–Malott JM, Glasgow RE, O'Neill K, et al. Co-worker social support in a worksite smoking control program. J Appl Behav Anal 1984;17:485–95. 24 smokers in work site programme, Controlled smoking (CS): 6 weekly group meetings focused on strategies to support nicotine fading, session 4 subjects decide to quit or not. Partner support (CSPS) condition: as above but subjects buddied up with colleague in the group to contact each day, also given manual and checklists of helpful behaviours.</p> <p>–McIntyre-Kingslover K, Lichtenstein E, Mermelstein RJ. Spouse training in a multi-component smoking cessation program. Behav Ther 1986;17:67–74. 64 smokers in smokers' clinic, Control groups (CG): 6 weekly 2 hour long group meetings. Quit at fourth group. Spouse training (ST): above plus spouse attended all sessions and given guidelines.</p>

	<p>–Mermelstein R, Cohen S, Lichtenstein E, et al. Social support and smoking cessation and maintenance. J Consult Clin Psychol 1986;54:447–53. 64 smokers: 15 spouse training, 21 no spouse training, and 28 “singles”, Control groups (CG): 6 weekly 2 hour long group meetings. Quit at fourth group. Spouse training (ST): above plus spouse attended all sessions and given guidelines, additional “singles” group with same format as no spouse training group.</p> <p>–Nyborg KF, Nevid JS. Couples who smoke, a comparison of couples training versus individual training for smoking cessation. Behav Ther 1986;17:620–5. 40 smoking couples, 8 in each of 5 conditions, therapist administered v minimal contact crossed with couples v individual training, and “effort only” control group. 8 week programme, week 5 is quit date, nicotine fading before quit. Visits to clinic for therapy plus manual (TA), v manual and weekly therapist initiated phone calls (minimal contact group (MC). “Couples” groups (CT) given instructions for mutual support. “Individual” group (IT) given no additional instruction, individual effort emphasised. Control group given written materials only (CG).</p> <p>–Orleans CT, Schoenbach VJ, Wagner EH, et al. Self help quit smoking interventions: effects of self help materials, social support instructions and telephone counseling. J Consult Clin Psychol 1991;59:439–48. 2021 smokers in community sample recruited to “self help quit smoking programme”. 4 conditions: 502 received self quitting materials only including advice about nicotine fading, relapse prevention, also general advice how to garner support (M). 501 received above plus specific social support instructions aimed at smokers, ex-smokers, and never smokers, copies to be given to 2 “allies” (MS). 510 above plus 4 follow up phone calls from counsellor and offer of a quit phone line to contact (MST). 508 in usual care group received referral guide and general quit tips pamphlet (C).</p> <p>–West R, Edwards M, Hajek P. A randomized controlled trial of a ‘buddy’ system to improve success at giving up smoking in general practice. Addiction 1998;93:1007–11. 172 smokers in general practice, 70 in “buddy” pairs and 102 in “solo” group. Nurse led smokers clinic, 4 visits over 5 weeks, quit at visit 2. “Buddy” condition (B): subjects paired with smoker, all subsequent visits with them. Phone calls and bets made. “Solo” condition (S): subjects seen individually.</p>
*Review quality	A (2) Adequate/Reported: The aim/scope or the review was well defined.
See below for “A-G”	B (2) Adequate/Reported: Search strategy used included/described.
quality	C (2) Adequate/Reported: Inclusion criteria appropriate/un-biased.
questions†	D (1) Adequate
	E (2) Adequate
	F (1) Adequate
	G (1) Adequate
	‡§TOTAL: 11 points; Good.
Results (relevant to scope of current review)	Studies have generally found that having such a buddy is positively correlated with success in stopping smoking. In some circumstances participants who engaged a buddy were three times more likely to quit. However, the finding is not universal.
Authors’ conclusions	<p>–The finding that many people engaged a buddy when prompted to suggests the practicality of simple social support manipulations if they can be shown to be effective.</p> <p>–In most cases researchers were attempting to influence pre-existing supportive relationships, often with a spouse. Interventions involving new ties (“common adversity”) and interventions using existing ones can both offer the “buddies” various levels of training. However, the latter involve attempting to develop or change an established relationship. Other behavioural research suggests that these relationships can be very resistant to change.</p> <p>–The evidence would suggest that in the context of a smokers’ clinic the use of buddies may be of some benefit. There is a lack of evidence regarding the efficacy of the use of buddies in community interventions. The difficulty of translating the benefits of natural resources to effective interventions is not unique to this field.</p> <p>–Much of the research has required pre-existing support as an inclusion criterion. However, it may be that socially isolated smokers benefit more from interventions involving new ties.</p> <p>–The role of different aspects of buddy support also requires elucidation. For example, the relationship between expected and received support may be of significance.</p> <p>–It is possible that if smokers benefit from the support of a new tie when quitting, they may be expected to have greater relapse rates when the support ends. Whereas pre-existing support may continue its influence over a longer period.</p>
Reviewers notes	In the time period that this review was conducted, most research in the area did not use a randomised design so only a small proportion of the originally identified studies were included.
Relevance to study question	Yes specifically reviews the buddy-system in smoking cessation interventions.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

‡ For each individual answer, the following scores were assigned:

†The quality of systematic reviews was assessed using the following questions:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

(A) Was a clinical question clearly defined?

(B) Was an adequate search strategy used?

(C) Were the inclusion criteria appropriate and applied in an unbiased way?

§ The following thresholds for study quality have been applied:

(D) Was a quality assessment of included studies undertaken?

– An overall study score of 1-4 is rated Poor

(E) Were the characteristics and results of the individual studies appropriately summarised?

– An overall study score of 5-10 is rated Fair

(F) Were the methods for pooling the data appropriate?

– An overall study score of 11-14 is rated Good

(G) Were sources of heterogeneity explored?

Abbreviations: RCT = randomised controlled trial

13.2 Data extraction tables: Primary research studies

Citation	Gruder, C. L., R. J. Mermelstein, et al. (1993) Effects of social support and relapse prevention training as adjuncts to a televised smoking-cessation intervention. Journal of consulting and clinical psychology 113-120
Level of evidence *	II
Country	USA
Research question/aims	To test the effectiveness of brief group adjuncts (buddy and group n=271, or group only n=287: both that taught social support and relapse prevention skills) to a cessation intervention comprised of a television program and written self-help materials.
Study type/design	Cluster-RCT (four-group) sites, and not subjects, were randomly assigned to conditions
Participant group	Smokers recruited from the community
Intervention	<p>Components</p> <p>(1) Self-help manual: the American Lung Association's self-help manual, Freedom From Smoking in 20 Days.</p> <p>(2) Encouragement to watch television news broadcasts twice daily that presented twenty segments based on the manual.</p> <p>(3) Subjects in the social support and discussion conditions were scheduled to attend three weekly 90-min group meetings held during the 20-day program and to receive two leader-initiated telephone calls 1 and 2 months after the program ended.</p> <p>(3a) Subjects required to bring a non-smoking buddy to the second group meeting, during which the buddies met separately in their own group. The buddies also received telephone calls from their group leaders at 1 and 2 months post-intervention. During the buddies' meeting, the group leaders discussed general information about the program but did not instruct the buddies on specific ways to be helpful.</p> <p>(3b) Subjects required to bring a non-smoking buddy to the second group meeting as in condition (3a). In addition, subjects were given instructions on how to get help from their buddies and others and how to neutralize people who were unhelpful. Specific scenarios about how to work with buddies were discussed, and at the last group meeting, relapse prevention strategies were presented. Smokers in this condition also received an additional manual, the Quitter's Guide, which included topics on how to communicate with a buddy; how to benefit from non-smokers in one's social network; how to minimize the hazards of interacting with smokers; and how to avoid and cope with slips and relapses. Buddies in the social support condition received the Buddy Guide, which included the rationale for buddies; why it is difficult to stop what buddies will get from helping the smokers; how to communicate with their partners; specific suggestions for things to do and not to do; and how to help new ex-smokers remain abstinent. At their meeting, buddies were instructed in specific ways to assist their partners and were given instructions on helpful and unhelpful buddy behaviours.</p>
Comparator	Subjects (n=235) in the no-contact control condition did not receive any other treatment but the self-help manual and instructions to watch the television program.
Outcome definitions	Self-reported abstinence rates for single-point prevalence and multiple-point prevalence (percentage of subjects who met the criteria for abstinence at a given measurement wave and all previous measurement waves)
Data analyses & statistics	Analysis of the repeated classifications of smoking status at the four time points (i.e., post-intervention and 6,12, and 24 months), random-effects probit model is a dichotomous analogue of the random-effects regression models
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: Reported
	B. (1) Inadequate/Not possible
	C. (2) Adequate/Reported: Yes reported no significant group differences
	D. (2) Adequate/Reported
	E. (2) Yes reported
	F. (2) Yes reported
	G. (2) Yes reported for each group
	TOTAL: 13 points; Good.
Results (within scope of this review)	No-contact control (n=109) 12.8% single point prevalence abstinence 1.8% multiple-point prevalence
	No shows (n=190) 13.7% single point prevalence abstinence 2.6% multiple-point prevalence
	Discussion (n=86) 18.6% single point prevalence abstinence 4.7% multiple-point prevalence
	Social support (n=104) 21.2% single point prevalence abstinence 7.7% multiple-point prevalence
	At 24 months no-contact controls versus others (p < .001); no shows versus two group

	conditions($p < .006$); discussion versus social support ($p < .03$). Significant differences through 24 months attributable to the strong intervention effects on cessation, not to significant differences in maintenance.
Authors conclusions	These results also show that even after controlling for levels of program participation, the social support condition had significantly better outcomes than did the discussion condition. Thus, it is likely that the social support condition enhanced cessation through increasing levels of social support. The social support condition significantly enhanced the initial cessation rates both by increasing support provided by a buddy and by increasing the use of the self-help manual and television program and it also increased the levels of support received by smokers: specifically, the social support training for smokers and their buddies increased the ratio of positive to negative interactions, primarily by decreasing unhelpful (e.g., nagging, policing) smoker-buddy interactions as indicated by the PIQ-20 scores. Unfortunately, despite the strong initial cessation effects obtained in this study, the social support condition did not significantly enhance maintenance through reducing relapse rates. This lack of differences might have been attributable to insufficient relapse prevention training in the social support condition.
Reviewers notes	The challenge still remains to provide training in relapse prevention skills in a limited time and with minimal counsellor input required for minimal assistance programs.
Relevance to study question	Relevant in that it tests the buddy component in a behaviour change intervention

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Hennrikus, D., P. Pirie, et al. (2010). "Increasing support for smoking cessation during pregnancy and postpartum: Results of a randomized controlled pilot study." Preventive Medicine: An International Journal Devoted to Practice and Theory 50(3): 134-137.
Level of evidence *	III
Country	USA
Research question/aims	To examine the feasibility and effectiveness of an intervention to mobilise women in the social networks of pregnant smokers to support smoking cessation.
Study type/design	RCT: Dyads (i.e., subject and supporter) were randomly assigned to intervention or control groups.
Participant group	Pregnant smokers recruited from urban Women, Infants, and Children clinics and an outpatient obstetric clinic.
Intervention	<p>The intervention included one in-person session for intervention and control group subjects. Supporters in the intervention group had one in-person visit and monthly telephone sessions; supporters in the control group were not contacted.</p> <p>Subject session: The single counselling session for all subjects was designed to increase motivation to quit and provide information about community smoking cessation resources.</p> <p>Supporter sessions: The primary goal of the supporter sessions was to develop strategies to help the subject quit smoking. The supporter and counsellor identified specific activities to support the subject's efforts to quit: the counsellor asked the supporter to select activities to try in the next month. Subsequent telephone contacts between the counsellor and the supporter reviewed support efforts in the previous month and planned efforts for the upcoming month.</p> <p>Scrapbook: Intervention subjects and supporters received materials to create a pregnancy scrapbook that included pages related to the smoking cessation tasks. The scrapbook was intended to facilitate interaction between dyads.</p>
Comparator	One in-person session (as per the intervention group) but supporters in the control group were not contacted.
Outcome definitions	<p>Smoking: The main measure of subject smoking was self-reported seven-day point prevalence abstinence validated using dipsticks to test for urine cotinine and the number of cigarettes the subjects smoked per day and time to the first cigarette of the day, as well as the current and past smoking status of supporters.</p> <p>Support behaviours: Subjects were asked to report the frequency of 29 behaviours by their supporter since enrolment in the intervention (i.e., prior to delivery assessment) or since the baby was born (i.e., 3 months postpartum assessment). Items about support included the subject's rating of their supporter's commitment to help them quit smoking and items from the Partner Interaction Questionnaire.</p>
Data analyses & statistics	<p>All statistical tests were chi-square or t-tests. Analyses of smoking outcomes were intent-to-treat: subjects with missing data were considered smokers.</p> <p>At the end of pregnancy, 58% of the intervention subjects rated their supporter's commitment to helping them quit as high compared with 30% in the control group (chi-square=4.53, $p<0.05$).</p> <p>At 3 months postpartum, the respective percentages were 60% vs. 39% (chi square=2.22, $p=0.14$). At the end of pregnancy, intent-to-treat analysis showed a non-significant trend for more validated quits in the intervention group: 13.0% vs. 3.6% among the controls.</p> <p>Intervention subjects who chose friends as supporters were more likely to quit (21.7%) than were women who chose relatives (6.5%). There was a non-significant trend for more validated quits when supporters were ex-smokers (18.2%) than when they were never smokers (13.3%) or current smokers (10.7%).</p> <p>There was considerable relapse at 3 months postpartum: quit rates decreased to 9.3% in the intervention group and 0% in the control group.</p>
Study quality (See below for A-G quality questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: blocked random allocation sequence
	B. (1) Inadequate: Not possible
	C. (2) Adequate/Reported:
	D. (2) Adequate/Reported
	E. (2) Adequate/Reported
	F. (2) Adequate/Reported
	G. (2) Adequate/Reported
	TOTAL: 13 points; Good.
Results (within scope of this review)	Because this was a pilot study, it was not powered to detect the expected intervention effect.
Authors conclusions	We found that increasing support from a female friend or family member is a promising prenatal smoking cessation strategy. Our finding that friends might be more effective

	supporters than family members is consistent with the observation that social exchanges between partners, or by extension with family members, might be so stable that they are difficult to change.
Reviewers notes	The intervention allocated considerably resources to training and working with the support people (Buddies) to develop their helping strategies (more input than with the smoking subjects. This appeared to be effective, but less so for “partners”.
Relevance to study question	Yes relevant ... tests the buddy system (with trained buddies).

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Martire, L. M., R. Schulz, et al. (2007). "Couple-oriented education and support intervention: Effects on individuals with osteoarthritis and their spouses." <i>Rehabilitation Psychology</i> 52(2): 121-132.
Level of evidence *	Level II
Country	USA
Research question/aims	To determine whether a couple-oriented education and support intervention for osteoarthritis was more efficacious than a similar patient-oriented intervention in terms of enhancing spouses' support of patients and their positive and negative responses to patient pain.
Study type/design	RCT (three group) total n = 142 (89/99/54)
Participant group	Patients recruited through rheumatology clinics, 50 years of age or older, married, and diagnosed with hip or knee osteoarthritis (OA), and who had experienced pain of at least moderate intensity on most days over the past month, had difficulty with at least one instrumental activity of daily living (e.g., household tasks or driving), and had received assistance from the spouse with at least one instrumental activity of daily living.
Intervention	<p>(1) Patient-oriented education and support (PES; n = 89) six weekly 2-hr sessions (the "Arthritis Self-Management Program" delivered by staff of the Arthritis Foundation, and previously shown to successfully reduce pain severity and depressive symptomatology and to enhance a sense of efficacy in managing arthritis pain and other symptoms). The PES group specifically focused on self-management of arthritis, and each session was attended by 4 to 6 individuals with OA. No spouses, family members, or friends participated in PES sessions.</p> <p>(2) Couple-oriented education and support (CES; n = 99). The CES protocol was a group education and support intervention as per the PES protocol- However, the sessions were attended by participants and their spouses and topics were framed as couples' issues whenever possible. An overarching framework was that spouses' concerns and experiences and behaviours as support providers are important and that they have potential for influencing outcomes.</p> <p>i.e. spouses were 'directly trained' in being supportive and pp to five monthly booster sessions were conducted via telephone over the 6-month interim between the end of each intervention and the final follow-up assessment to review patients' and spouses' progress in meeting goals that were set during the intervention sessions.</p>
Comparator	Usual medical care (n = 54)
Outcome definitions	Spouses' support and responses to patient pain were assessed using four subscales from the West Haven-Yale Multidimensional Pain Inventory (Kerns et al., 1985), used to evaluate pain patients' social environment. The Support subscale (three items) assesses general supportiveness, worry, and attentiveness that the spouse has shown. The Distracting Responses subscale (four items) assesses attempts to get the patient involved in other activities. The Punishing Responses subscale (four items) assesses the extent to which spouses ignored patients or expressed irritation, anger, or frustration. The Solicitous Responses subscale (six items) assesses attempts to take over the patient's tasks and encourage reliance on others.
Data analyses & statistics	Post-intervention differences between groups on the outcome measures were tested using repeated measures analyses of covariance to determine the statistical significance ($p = .05$) of the Group X Time interaction. All analyses were conducted with the completers sample (i.e., those who attended at least once to either the PES or the CES group).
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/ rating§)	A. (0) Unknown/Not reported
	B. (1) Inadequate
	C. (2) Adequate/Reported: Yes
	D. (2) Adequate/Reported
	E. (2) Adequate/Reported: Yes
	F. (1) Inadequate
	G. (2) Adequate/Reported
	TOTAL: 10 points; Fair.
Results (within scope of this review)	<p>Patients in the CES group experienced a greater increase in spouse support than did those in the PES group, $p = .03$. The effect size was small (Cohen's $d = .22$).</p> <p>Analyses indicated a trend for the advantage of the CES protocol over the PES protocol at the post-intervention assessment for distracting responses, $p = .07$. This effect was medium in size ($d = .59$). Spouses made increased efforts to distract patients from their pain if they participated in the couples intervention but did not do so if they participated in the patient intervention.</p>

	<p>We also observed a significant Group X Time interaction for punishing responses at the post-intervention assessment, indicating an advantage of the CES protocol over the PES protocol, $p = .05$, and a small effect size ($d = .03$).</p> <p>For solicitous responses, there was no significant time effect or Group x Time interaction.</p>
Authors conclusions	<p>In this report, we showed that OA patients in a couple-oriented education and support intervention experienced greater improvements in spousal support and punishing responses than those who received education and support without spouse involvement. This study is one of a handful designed to evaluate the comparative efficacy (changes in interactions with the spouse) of patient- and couple-oriented interventions for a chronic physical illness.</p> <p>The changes that were observed in spousal support and responses were small, and the effect on punishing responses was short term (i.e., observed at the post-intervention assessment but not at the 6-month follow-up), indicating that future research should be aimed at enhancing the potential of dyadic interventions. Our findings suggest that a dyadic psychosocial intervention for chronic illness that addresses issues such as partners' concerns, supportive and unsupportive communications, and effective strategies for providing assistance may lead to improvements in illness-specific interactions.</p>
Reviewers notes	<p>Did not report on changes in patient pain or physical function only spousal support/interactions.</p> <p>Approximately 30% of the couples had dropped out of the study by the 6-month follow-up, resulting in missing follow-up data.</p>
Relevance to study question	<p>Yes relevant as the intervention is a 'buddy intervention' involving direct-training of buddies in a group format.</p>

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	May, S., R. West, et al. (2006). "Randomized controlled trial of a social support ('buddy') intervention for smoking cessation." Patient Education and Counseling 64(1-3): 235-241.												
Level of evidence *	II												
Country	UK												
Research question/aims	To assess the effectiveness of including a social support intervention ('buddy system') in a group treatment programme to aid smoking cessation.												
Study type/design	cluster-RCT (n=563)												
Participant group	Smokers attending groups at a smokers' clinic.												
Intervention	Groups in which smokers were paired with another person to provide mutual support (buddy condition: N = 237 in 14 groups). Participants were seen weekly for the first 4 weeks after stopping then followed up again after 26 weeks. Participants were invited to introduce themselves and were then asked to choose someone to be their buddy and sit down next to that person. They then swapped names and phone numbers with their buddy and arranged a time to make their first call, with subsequent calls alternating between them every day for the first week. No particular training or advice was given to smokers about the content of these calls they were simply described as a way of buddies offering mutual support between visits (participants were also encouraged to enter into a contingency agreement with a small sum of money as 'security' contingent on both smokers remaining abstinent. This system was chosen as it is the standard procedure in group clinics using the withdrawal-oriented model, it had shown efficacy in previous research and it is easy to implement in a group setting (compared to spouse/partner training or recruiting ex-smoker volunteer buddies).												
Comparator	Groups to receive the same treatment as the experimental group without the buddy component (control: N = 326 in 20 groups). Participants were seen weekly for the first 4 weeks after stopping then followed up again after 26 weeks.												
Outcome definitions	Abstinence: self reported at 1, 4, and 26 weeks. Abstinence: measured in accordance with the Russell Standard at 1, 4, and 26 weeks: an expired-air carbon monoxide (CO) concentration of less than 10 ppm or less than 7 ppm above ambient was required to confirm non-smoking status. Also: motivation, determination, perceived likelihood of stopping, and support were measured via survey questions.												
Data analyses & statistics	Logistic regression analyses for the key outcome measures were undertaken using a random effects model taking account of the fact that participants were randomized by group.												
Study quality (See below for A-G quality questions‡, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: Yes (cluster randomisation)												
	B. (1) Inadequate: Not possible												
	C. (2) Adequate/Reported: Adjusted in analysis												
	D. (2) Adequate/Reported: Yes												
	E. (2) Adequate/Reported: Yes												
	F. (2) Adequate/Reported: Yes												
	G. (2) Adequate/Reported: Yes												
	TOTAL: 13 points; Good.												
Results (within scope of this review)	<table><tr><td>Outcome point</td><td>Unadjusted odds ratio (95% CI)</td><td>Adjusted odds ratio (95% CI)</td></tr><tr><td>1 week</td><td>1.66 (0.97–2.83)</td><td>1.45 (0.92–2.29)</td></tr><tr><td>4 weeks</td><td>1.39 (0.76–2.55)</td><td>1.16 (0.76–1.78)</td></tr><tr><td>26 weeks</td><td>0.84 (0.48–1.48)</td><td>0.79 (0.48–1.29)</td></tr></table>	Outcome point	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)	1 week	1.66 (0.97–2.83)	1.45 (0.92–2.29)	4 weeks	1.39 (0.76–2.55)	1.16 (0.76–1.78)	26 weeks	0.84 (0.48–1.48)	0.79 (0.48–1.29)
Outcome point	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)											
1 week	1.66 (0.97–2.83)	1.45 (0.92–2.29)											
4 weeks	1.39 (0.76–2.55)	1.16 (0.76–1.78)											
26 weeks	0.84 (0.48–1.48)	0.79 (0.48–1.29)											
Authors conclusions	The fact that the intervention was not able to demonstrate even a short-term effect indicates that any 'active ingredient' of the buddy intervention is likely to be small when used in group treatment programmes (although this need not be the case within individual treatment or self help programmes). Possibilities for increasing the strength of the buddying intervention include: (1) firmer guidance/training (2) a more rigorous protocol for establishing a new relationship between members of buddy pairs who have lost a partner (3) pairing up smokers at the initial visit rather than on the quit day.												
Reviewers notes	This was a good quality study with a large albeit group randomised sample. The intervention system was chosen as it is the standard procedure in group clinics using the withdrawal-oriented model, it had shown efficacy in previous research and it is easy to implement in a group setting (compared to spouse/partner training or recruiting ex-smoker volunteer buddies). However, by any measure, the intervention effect could not have been expected to be large given that it used 'non-significant other' buddy pairs with essentially no training ... within an already supportive group setting.												
Relevance to study question	Yes...but used a buddy system in a group setting with 'non-significant other' buddies (pseudo-assigned). This resulted in a fairly weak intervention.												

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies ‡ For each individual answer, the following scores were assigned:

†The quality of the study was assessed using the following questions:	
(A) Was the assignment to the treatment groups really random?	Adequate/reported = 2 Inadequate = 1 Unknown/not reported = 0
(B) Was the treatment allocation concealed?	
(C) Were the groups similar at baseline in terms of prognostic factors?	§ The following thresholds for study quality have been applied:
(D) Were the eligibility criteria specified?	
(E) Were the point estimates and measure of variability presented for the primary outcome measure?	– An overall study score of 1-4 is rated Poor
(F) Did the analysis include an intention-to-treat analysis?	– An overall study score of 5-10 is rated Fair
(G) Were withdrawals and dropouts completely described?	– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Stock, S., C. Miranda, et al. (2007). "Healthy buddies: A novel, peer-led health promotion program for the prevention of obesity and eating disorders in children in elementary school." <i>Pediatrics</i> 120(4): e1059-e1068.
Level of evidence *	III-2
Country	Canada
Research question/aims	To evaluate a novel health promotion program for elementary schools that was based on peer teaching from older to younger schoolchildren ("Healthy Buddies"). The program's content is based on 3 main components of healthy living: being physically active, eating healthy foods, and having a healthy body image. The objective of this study was to pilot Healthy Buddies in 1 elementary school and evaluate the effect of the program on students' health knowledge and behaviours, self-competence, body satisfaction, disordered eating behaviours and fitness, as well as physical characteristics of height, weight, BMI, blood pressure, and heart rate.
Study type/design	Two-group before-and-after
Participant group	Two Canadian elementary schools within a 'whole school' approach (n = 232 children, the whole school implementing the program; control: n = 151).
Intervention	Healthy Buddies is a peer-led health promotion program that we designed for use with elementary school students from kindergarten to 7th grade. Older "buddies" (4th through 7th grade) first receive a healthy-living lesson from their schoolteachers. These older buddies then act as peer teachers to deliver that lesson to their younger buddies (kindergarten through 3rd grade). Schoolteachers do not conduct separate lessons with the younger buddies. Healthy Buddies is implemented in the entire school with all paired classes progressing through the 21 (weekly) healthy-living lessons concurrently, bringing awareness about health promotion into the school milieu. The buddy pairs also spent 2 sessions per week doing 30-minute structured aerobic fitness sessions, called fitness loops. The main themes of the programme are: Regular Physical Activity, Healthy Eating, and Healthy Body Image, Self-esteem, and Social Responsibility. Students first learned about valuing themselves and others based on who they and others are on the inside. The Healthy Buddies program also addressed body-image and disordered eating issues by teaching kids about healthy growth and development and media literacy.
Comparator	Another school served as a 'no intervention' control.
Outcome definitions	Health knowledge and behaviours, self-competence, body satisfaction, disordered eating behaviours (all from the Healthy Living Questionnaire) and fitness (9-minute run), as well as physical characteristics of height, weight, BMI, blood pressure, and heart rate. One-on-one age appropriate assisted administration by trained undergraduate volunteers/doctors.
Data analyses & statistics	Used a 2-tailed paired t test to evaluate the significance of the changes in the various parameters over the 10-month study. Considering potential correlation within school class, the effect of the intervention was assessed by using mixed-effects model analysis with class as the cluster, after controlling for gender and grade.
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/rating§)	A. (1) Inadequate: Not a randomised trial
	B. (1) Inadequate: Not a randomised trial
	C. (2) Adequate/Reported: Yes
	D. (2) Adequate/Reported
	E. (2) Adequate/Reported: Yes
	F. (1) Inadequate
	G. (1) Inadequate
	TOTAL: 10 points; Fair.
Results (within scope of this review)	Compared with control students, both older and younger intervention students showed an increase in healthy-living knowledge ($P < .001$), behaviour ($P = .025$ for 4th through 7th grade children), and attitude scores and a smaller increase in systolic blood pressure (mean: 1.0 mm Hg; 95% CI: -1.1 to 3.1 mm Hg compared with the students in the control group (mean: 5.4 mm Hg; 95% CI: 2.6 to 8.1 mm Hg) $P = .025$). BMI and weight increased less in the intervention students in 4th through 7th grade ($P < .008$) and height more in the intervention students in kindergarten through 3rd grade. In both the intervention and control school, 9-minute run performance increased but with no between group difference (NS) between the beginning and the end of the 10-month study.
Authors conclusions	The student-led curriculum improved knowledge not only in older school children but also in their younger buddies. It also decreased weight velocity in the older students. Student-led teaching may be an efficient, easy-to-implement way of promoting a healthy lifestyle from kindergarten to 7th grade.
Reviewers notes	This pilot study evaluated a school-based programme with a 'captive audience', therefore generalisability to other health promoting contexts is not known. However it does demonstrate the use of a buddy-system in a comprehensive programme over time. The focus on physical activity, nutrition alongside body image, self-esteem, and social responsibility is an approach that could potentially be adopted in other multiple-risk-

	factor interventions in various community settings.
Relevance to study question	Yes uses a buddy system in a school setting to promote healthy living. This intervention has a very strong early intervention/prevention focus.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Tevyaw, T. O., B. Borsari, et al. (2007) Peer enhancement of a brief motivational intervention with mandated college students. Psychology of addictive behaviors : journal of the Society of Psychologists in Addictive Behaviors 114-119 DOI: 10.1037/0893-164X.21.1.114
Level of evidence *	II/III-1 (small sample RCT)
Country	USA
Research question/aims	To evaluate whether incorporating a peer in a brief motivational intervention would lead to significant reductions in alcohol use and problems in students mandated to receive treatment after violating campus alcohol policy.
Study type/design	RCT
Participant group	Subjects: University students (n=36) between 18 and 24 years old mandated to receive treatment after violating campus alcohol policy and had attended a mandatory alcohol education class. Peers: peers were eligible to participate if they (a) were 18 to 24 years old; (b) were not a current or previous romantic partner; (c) were the same gender as the participant; (d) reported seeing the participant at least once a week, in order to ensure regular contact; (e) rated by the participant as "important," "very important," or "extremely important" to them on the Important People Instrument and (f) were rated by the participant as "supportive," "very supportive," or "extremely supportive" on the IPI.
Intervention	Two 45-min sessions of motivational interviewing a peer-enhanced motivational intervention (PMI, n = 18).
Comparator	Two 45-min sessions of motivational interviewing an individual motivational intervention (IMI, n = 18).
Outcome definitions	Number of drinking days and heavy drinking days at 1-month follow-up. Alcohol use over the previous 30 days was assessed with the Time Line Follow-Back Interview. Alcohol-related problems in the past year were recorded with the Young Adults Alcohol Problem Screening Test (YAAPST). The Peer Involvement Questionnaire, asked participants how they felt about their peers' involvement in the intervention in terms of comfort, ability to openly discuss issues, and the level of perceived support from the peer following the intervention.
Data analyses & statistics	Univariate tests were performed to assess treatment response on number of drinks per occasion, number of heavy drinking days, number of drinking days, and the YAAPST severity score. Hierarchical regressions on each of the four outcome variables to examine group differences at follow-up.
Study quality (See below for A-G quality questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: gender stratified
	B. (1) Inadequate: Not possible
	C. (2) Adequate/Reported: no significant differences
	D. (2) Adequate/Reported: yes
	E. (2) Adequate/Reported: yes
	F. (0) Unknown/not reported
	G. (1) Inadequate: yes eight participants did not return to complete the 1-month follow-up
	TOTAL: 10 points; Fair.
Results (within scope of this review)	Effect sizes revealed that the magnitude of within-group reductions in alcohol use and problems were three times larger on average for the PMI group (average effect size = 0.68) than for the IMI group (average effect size = 0.22). Moderate between-group differences were observed for number of drinking-days and alcohol-related problems. Overall, small effect sizes were observed for peers of participants.
Authors conclusions	Both IMI and PMI groups demonstrated significant reductions in the number of drinking days and heavy drinking days (effect sizes were three times larger on average for the PMI group than for the IMI group. In addition, peers were willing to participate in an intervention addressing alcohol use, were supportive of the participant during the process, and viewed the sessions as being effective. The findings suggest that including peers in BMIs may be an effective way to facilitate drinking reductions in mandated students who have already begun to demonstrate negative consequences from their drinking.
Reviewers notes	Note that the peers were not specifically trained in their roles. The treatment provider worked to establish rapport with both and encouraged them to discuss the information following the session in an ongoing manner. The participant was asked to generate strategies to reduce his or her drinking and the peer was encouraged to help develop and implement these strategies.
Relevance to study question	Yes, directly relevant in that it is a behaviour change buddy-intervention with MI.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the

‡ For each individual answer, the following scores were assigned:

following questions:	Adequate/reported = 2
(A) Was the assignment to the treatment groups really random?	Inadequate = 1
(B) Was the treatment allocation concealed?	Unknown/not reported = 0
(C) Were the groups similar at baseline in terms of prognostic factors?	§ The following thresholds for study quality have been applied:
(D) Were the eligibility criteria specified?	
(E) Were the point estimates and measure of variability presented for the primary outcome measure?	
(F) Did the analysis include an intention-to-treat analysis?	
(G) Were withdrawals and dropouts completely described?	
	– An overall study score of 1-4 is rated Poor
	– An overall study score of 5-10 is rated Fair
	– An overall study score of 11-14 is rated Good

Abbreviations: YAAPST = Young Adults Alcohol Problem Screening Test

Citation	West, R., M. Edwards, et al. (1998) A randomized controlled trial of a 'buddy' system to improve success at giving up smoking in general practice. <i>Addiction</i> 1007-1011
Level of evidence *	II
Country	UK
Research question/aims	To assess the effect on abstinence rates of pairing up smokers attending a general practice smokers, clinic to provide mutual support between clinic sessions.
Study type/design	RCT
Participant group	Patients of a general practice clinic in London, recruited by mail (n = 172). Smokers in the buddy condition were paired with others of the same sex.
Intervention	Session 1) Smokers see a practice nurse in pairs (buddy-system) for a 20 min session. Buddy pairs were introduced to each other while waiting to be seen together. In addition, as a voluntary adjunct, they were invited to enter into a contract with a small incentive amount of money wagered on abstinence (32/35 buddy patients agreed to place a bet on their partner). They were invited to phone or otherwise contact each other at least once a day over the next week and at any time that they needed support. They were scheduled to attend all further sessions together. The nurse assessed their level of dependence, discussed options for NRT, the advantages and disadvantages of the patch, gum and nasal spray were outlined. The nurse then measured their expired air carbon monoxide concentrations, and explained its significance. The nurse advised the patient to continue smoking until the next session. No specific 'training' in buddy skills was provided beyond the above advice. Session 2) was designated as their point of stopping smoking. Again seen by a nurse and their expired air CO was measured. Prescription for NRT given along with a simple set of guidelines on maintaining abstinence and the importance of not smoking.
Comparator	As above except participants were seen one-on-one by the nurse (no buddy system).
Outcome definitions	The percentage of smokers still abstinent from cigarettes at end of treatment (4 weeks from quit date), verified by expired air carbon monoxide concentration.
Data analyses & statistics	Random effects logistic regression
Study quality (See below for A-G quality questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: Yes
	B. (1) Inadequate: Not possible
	C. (2) Adequate/Reported: Yes
	D. (2) Adequate/Reported: Yes
	E. (2) Adequate/Reported: Yes
	F. (2) Adequate/Reported: Yes. "no shows" analysed as smokers
	G. (2) Adequate/Reported: Yes, assumed as smokers
	TOTAL: 13 points; Good.
Results (within scope of this review)	Forty % of subjects were still abstinent 1-week after the quit date in the buddy condition compared with 22% in the solo condition (p<0.01). Twenty-seven % of subjects in the buddy condition were still abstinent at the end of treatment (4-weeks after the quit date) compared with 12% in the solo condition (p<0.01).
Authors conclusions	The analysis showed that the odds of patients in the buddy condition remaining abstinent after 1-week were 2.5 times those of solo patients (p<0.02) and after 4 weeks the corresponding odds ratio was 2.6 (p<0.05). There was clear evidence for efficacy and, given that the buddy system is a minimal cost element of a smokers', clinic package, the cost-efficacy is very high. The buddy condition was significantly superior to the solo condition at both time points.
Reviewers notes	Consider how well the system would operate in different settings, which aspects of the buddy-system were important (e.g. being seen by the nurse in pairs, competition, mutual support) and the acceptability and possible problems of pairing up smokers in different settings.
Relevance to study question	Yes relevant. As in West 2006, the 'participant' and 'buddy' are both smoking 'patients' therefore the buddy-pair as a unit are seeking treatment (i.e. the buddy is not simply a non-participating support person).

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

(F) Did the analysis include an intention-to-treat analysis? – An overall study score of 11-14 is rated Good
(G) Were withdrawals and dropouts completely described?

Abbreviations: NRT = nicotine replacement therapy

Citation	Albrecht, S. A., D. Caruthers, et al. (2006). "A Randomized Controlled Trial of a Smoking Cessation Intervention for Pregnant Adolescents." <i>Nursing research</i> 55(6): 402-410.
Level of evidence *	II
Country	USA
Research question/aims	To examine differences in short- and long-term smoking behaviours among three groups: Teen FreshStart (TFS), Teen FreshStart Plus Buddy (TFS-B), and Usual Care (UC) control.
Study type/design	RCT, three group, repeated measures
Participant group	Smokers: 142 pregnant adolescents who were aged 14 to 19 years.
Intervention	The TFS intervention consisted of an 8-week group program designed to promote and maintain smoking abstinence based on the Cognitive Behavioural Theory using a group setting with individual support, peer modelling, and peer sanctions to promote smoking cessation. The TFS-B group received the same 8-week programming, but the participants were required to identify and bring a non-smoking female of a similar age as their buddy to the sessions. The role of the buddy was to reinforce smoking cessation strategies and to provide social support to the participant throughout the study.
Comparator	Routine care that all teens would typically receive from a healthcare provider throughout their pregnancy: smoking during pregnancy was addressed in the antenatal clinics or centrally located community site.
Outcome definitions	-Self-reported smoking status was assessed using the Smoking History Questionnaire (SHQ) -Saliva cotinine levels were used to identify current smoking or abstinence objectively
Data analyses & statistics	Logistic regression. Comparisons for continuous variables were examined using analysis of variance with Bonferroni adjustment
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: Yes
	B. (2) Adequate/Reported: Yes (single)
	C. (2) Adequate/Reported: Yes
	D. (2) Adequate/Reported: Yes
	E. (2) Adequate/Reported: Yes
	F. (2) Adequate/Reported: Yes
	G. (2) Adequate/Reported: Yes
	TOTAL: 14 points; Good.
Results (within scope of this review)	A significant difference was found between the UC group (11% abstinence) and the TFS-B group (35% abstinence) ($\beta = 1.316$, $p = .010$, 99% CI = 1.001, 13.893). A greater percentage of adolescents in the TFS-B group reported smoking abstinence at this time point. However, the effect was not sustained beyond postpartum 1-year following study entry: UC group (11% abstinence), TFS group (12% abstinence) and the TFS-B group (9% abstinence) all n/s.
Authors conclusions	The TFS-B intervention was significantly more effective in attaining short-term smoking cessation in the pregnant adolescent than UC but was not different than TFS alone. It was demonstrated in this study that young pregnant smokers have difficulty with relapse, just like their adult counterparts. The peer-enhanced programming had a limited effect but could not sustain well beyond postpartum (1 year following study entry).
Reviewers notes	Adequate power was not achieved with a sample of 142 randomized participants and only 80/142 remaining at 1-year follow-up. The sample size may have had an impact on the outcome results.
Relevance to study question	Yes ... use of a buddy-system. No specific buddy training as such... simple participation.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

- (A) Was the assignment to the treatment groups really random?
- (B) Was the treatment allocation concealed?
- (C) Were the groups similar at baseline in terms of prognostic factors?
- (D) Were the eligibility criteria specified?
- (E) Were the point estimates and measure of variability presented for the primary outcome measure?
- (F) Did the analysis include an intention-to-treat analysis?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2
Inadequate = 1
Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

- An overall study score of 1-4 is rated Poor
- An overall study score of 5-10 is rated Fair
- An overall study score of 11-14 is rated Good

(G) Were withdrawals and dropouts completely described?

Abbreviations: TFS = Teen FreshStart; TFS-B = Teen FreshStart Plus Buddy

Citation	Carlson, L. E., E. Goodey, et al. (2002). "The addition of social support to a community-based large-group behavioral smoking cessation intervention: improved cessation rates and gender differences." <i>Addictive Behaviors</i> 27(4): 547-559.
Level of evidence *	III-2
Country	Canada
Research question/aims	To determine the effects on cessation rates of adding a partner support group component to a large-group community-based behavioural smoking cessation program.
Study type/design	Non-randomised comparative study with concurrent controls (Over 8 groups n=557 and 26% had support person for at least one session)
Participant group	Participants: self-referred recruited from the community via public service announcements were enrolled in the Smoking Cessation Program offered through a cancer centre/clinic Support people: were spouses, children, parents, and/or friends of individuals participating in the smoking cessation program.
Intervention	Smokers: group sessions with support buddy (including two separate training sessions for the buddies). Main group program has eight sessions spread out over 3 months (n=148) Support people: two of the eight sessions, 1 week prior and 1 week following the quit date. Discussion/training/education about tobacco addiction, techniques for smoking cessation, expected withdrawal symptoms, supportive vs. undermining (critical) behaviour, self-care for the support person, and specific problem-solving around issues raised by the participants.
Comparator	Group sessions without support buddy. The group program has eight sessions spread out over 3 months (n=409)
Outcome definitions	Self-report 3-month continually abstinent Self-report 6- and 12-month follow-ups, point-prevalence rates
Data analyses & statistics	Chi-squared analyses/intent-to-treat
Study quality (See below for A-G quality questions†, criteria scores‡ and total/rating§)	A. (1) Inadequate: Not a randomised trial
	B. (1) Inadequate: Not a randomised trial
	C. (2) Adequate/Reported: yes
	D. (2) Adequate/Reported: yes
	E. (2) Adequate/Reported: yes
	F. (2) Adequate/Reported: yes
	G. (2) Adequate/Reported: yes, assumed to be smokers
	TOTAL: 12 points; Good.
Results (within scope of this review)	<p>– Overall rate of successful smoking cessation at 3 months: 41.5% (231/557); for those with a support person, the cessation rate was 56.1% (83/148), compared to 36.2% (148/409) for those without a support person (P < .001).</p> <p>– At the 6-month point, overall, 37.6% (165/439); with a support person, 45.5% (55/121); without a support person, 34.6% (110/318) (P < .05) (n=439).</p> <p>– At the 12-month follow-up: overall, 35.1% (155/442); with a support person, 43.2% (54/125); without a support person, 31.9% (101/317) (P < .05) (n=422).</p> <p>Gender differences</p> <p>Comparing men and women overall, there were no significant differences in quit rates at any time-point, though there was a slight trend for men to be more successful at the 12-month point (P = .14). However, looking at the effect of having a support person, it appears that men did benefit from support more than women in the longer term. The beneficial effects of support were maintained in the men up to the 12-month follow-up assessment, with supported men achieving more than 20% greater cessation rates than women and unsupported men after 12 months.</p>
Authors conclusions	<p>The results of this study confirm, in a large sample of smokers, previously reported associations between social support and success at smoking cessation. The overall success rates of this program, with abstinence rates of 42%, 38%, and 35% (39%, 28%, and 26% using intent-to-treat analyses) at 3, 6, and 12 months, respectively, are higher than those found in other large-group behavioural cessation programs.</p> <p>Overall, this study demonstrated that adding a social support component to a large-group behavioural smoking cessation intervention was successful in improving 3-month quit rates in both men and women, compared to those found in participants who did not bring a support person to the sessions. This effect was maintained in the men, but dwindled in the women. Men with a support person achieved a cessation rate more than 20% greater than the other three groups, and significantly higher than that achieved by most similar intervention programs.</p>
Reviewers notes	Intervention applied to smokers and additionally to their supporters. This improvement cannot conclusively be attributed to the addition of the support program. It does, however, seem to be the major cause, since other changes have been minimal, and the same two individuals have been the leaders of the program since 1984.
Relevance to study question	Yes, involves the addition of a support buddy with training ... but in a group setting.

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†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Cholewa, S. and J. D. Irwin (2008). "Project IMPACT: Brief report on a pilot programme promoting physical activity among university students." Journal of Health Psychology 13(8): 1207-1212.
Level of evidence *	III-3
Country	Canada
Research question/aims	To evaluate the effectiveness of a buddy system, record-keeping device, or both for increasing university students' physical activity (PA).
Study type/design	Pre-and-post-test non-randomised controlled trial (participants were assigned to their preferred arm of the study) Nine-week follow-up.
Participant group	N=71 (51 completed all nine weeks)
Intervention	<p>– Participants attended an information session tailored for their assigned intervention arm. Two same-sex individuals who worked together to increase their PA were paired. A five level matching criterion was utilized.</p> <p>–Participants attended an information session tailored for their assigned intervention arm. A commercial, password protected on-line logbook was utilized for participants to track their activity frequency, duration, goals, and progress.</p>
Comparator	A combination of both "buddy" and "on-line logbook"
Outcome definitions	Self-reported physical activity, barriers efficacy, task efficacy, and BMI.
Data analyses & statistics	MANOVA
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/rating§)	A. (1) Inadequate: not a RCT
	B. (1) Inadequate: not a RCT
	C. (1) Inadequate: not a RCT so not fully known
	D. (2) Adequate/Reported: yes
	E. (2) Adequate/Reported: yes
	F. (1) Inadequate
	G. (2) Adequate/Reported: no significant differences
	TOTAL: 10 points; Fair.
Results (within scope of this review)	<p>– A significant positive effect on barriers efficacy over time across all conditions, ($p < .05$) accounting for 13.4 per cent of the variability in barrier self-efficacy.</p> <p>– No significant effects over time for either BMI or task.</p> <p>– At baseline, 49 per cent of participants were active compared to 68.6 per cent post-intervention.</p> <p>– A positive and significant effect in activity status over time existed for the combination arm of the study ($p < .05$) effect size = .04 (small).</p> <p>– A positive and significant effect in activity status over time existed for the recordkeeping device, ($p < .05$) effect size = .52 (large).</p> <p>– With regard to adoption, maintenance, and termination of PA status, 15 (29.4%) participants in the study adopted more PA. Twenty (39.2%) participants maintained activity, and five (9.8%) terminated activity. Finally, 11 (21.6%) participants remained inactive.</p>
Authors conclusions	<p>Participation in Project IMPACT was associated with a significant and positive increase in PA for both the combination and record-keeping device interventions. However, the buddy system intervention, on its own, was not impactful. Effect sizes for the record-keeping device and combination arms of Project IMPACT suggest that the buddy system did not enhance the combination arm; the success of both interventions was due to the record-keeping device.</p> <p>The buddy system should be modified and re-implemented. Specifically, modifying the categories of the matching form criteria and creating a system allowing participants to choose their own buddies is encouraged.</p>
Reviewers notes	While this drop-out was not statistically significant, it was detrimental to the power of the study (post-hoc power calculated at .50). This was not a RCT as this Authors stated that the intervention needed to be evaluated in a method consistent with its true-to-life functioning. However, an RCT would be required to test the intervention further. Despite the Authors previous work indicating self-selection of buddies is preferred by participants ... this was not done.
Relevance to study question	Yes but a very low level intervention essentially with no "motivational" or counselling element up-front and no training of buddies in their role as all were "participants".

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been

prognostic factors?	applied:
(D) Were the eligibility criteria specified?	
(E) Were the point estimates and measure of variability presented for the primary outcome measure?	– An overall study score of 1-4 is rated Poor
(F) Did the analysis include an intention-to-treat analysis?	– An overall study score of 5-10 is rated Fair
(G) Were withdrawals and dropouts completely described?	– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Donatelle, R. J., S. L. Prows, et al. (2000). "Randomised controlled trial using social support and financial incentives for high risk pregnant smokers: significant other supporter (SOS) program." Tobacco Control 9 Suppl 3: III67-69.
Level of evidence *	II
Country	USA
Research question/aims	To determine whether the combination of bolstered social support and financial incentives had an effect in significantly reducing smoking behaviour among low income, high risk, pregnant and postpartum women who participate in Oregon's Women, Infants, and Children (WIC) program
Study type/design	Cluster RCT, four sites, maximum of 10 intervention months
Participant group	220 low income, high risk pregnant smokers (112 treatment group, 108 control group)
Intervention	Education/self-help/incentives/Significant Other Supporter (SOS): verbal and written information on the importance of smoking cessation, a pregnancy/maternal specific, evaluated, smoking cessation self help kit, and all delivered by trained staff. AND treatment participants were asked to designate a social supporter, preferably a female non-smoker with whom the participant had a regular, close, positive association, PLUS participant and her social supporter were eligible to receive incentive vouchers if she was biochemically confirmed as quit. All participants telephoned monthly (maximum of 10 months), and were asked to self report their smoking status (\$50 voucher if confirmed quit).
Comparator	Education/self-help/incentives: verbal and written information on the importance of smoking cessation, a pregnancy/maternal specific, evaluated, smoking cessation self help kit, and all delivered by trained staff. PLUS participants were eligible to receive incentive vouchers if she was biochemically confirmed as quit. All participants telephoned monthly (maximum of 10 months), and were asked to self report their smoking status (\$50 voucher if confirmed quit).
Outcome definitions	Self-report smoking status and written surveys and salivary cotinine
Data analyses & statistics	Analysed based on intention-to-treat, where all those lost to follow up were considered to be smokers (no further description of the analysis was given)
Study quality (See below for A-G quality questions†, criteria scores‡ and total/rating§)	A. (1) Inadequate/Not Reported
	B. (1) Inadequate: Not possible
	C. (2) Adequate/Reported: Yes, no significant differences
	D. (2) Adequate/Reported: Yes described
	E. (2) Adequate/Reported: Yes described
	F. (2) Adequate/Reported: those lost to follow-up were considered to be smokers
	G. (2) Adequate/Reported: Yes described
	TOTAL: 12 points; Good.
Results (within scope of this review)	– Significant differences existed between treatment and control groups in percentages of smokers who were biochemically confirmed as quit at eight months gestation: quit rate 32% (intervention) 9% (control) ($p < 0.0001$), and also at two months postpartum quit rate 215 (intervention) 6% (control) ($p < 0.0009$). – Note Loss to follow up in both the treatment and control groups: (a) treatment loss to follow up was 32% at eight months gestation, and 36% at two months postpartum; (b) control loss to follow up was 51.5% at eight months gestation, and 52% at two months postpartum.
Authors conclusions	The intervention strategy utilised a theory-based “three pronged” approach: incentives, “bolstered” social supports, and community participation (local resources were effectively mobilised to reduce the need for “outside” financial assistance as incentive vouchers were purchased with funds voluntarily donated from healthcare organisations, businesses, and foundations).
Reviewers notes	The supporter's purpose was to offer “natural”, peer support during the smoking cessation process to the woman who was trying to quit but had no formal support-person training
Relevance to study question	Yes: included a buddy-system as a adjunct to an established self-help smoking cessation programme.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

-
- | | |
|--|---|
| (E) Were the point estimates and measure of variability presented for the primary outcome measure? | – An overall study score of 1-4 is rated Poor |
| (F) Did the analysis include an intention-to-treat analysis? | – An overall study score of 5-10 is rated Fair |
| (G) Were withdrawals and dropouts completely described? | – An overall study score of 11-14 is rated Good |

Abbreviations:

Citation	Fals-Stewart, W., G. R. Birchler, et al. (2006). "Learning sobriety together: A randomized clinical trial examining behavioral couples therapy with alcoholic female patients." Journal of consulting and clinical psychology 74(3): 579-591.
Level of evidence *	II
Country	USA
Research question/aims	To examine the comparative effects of BCT on the outcomes of married or cohabiting alcoholic female patients and their non-substance-abusing spouses or intimate partners. Hypothesis: that participants who received BCT would report lower frequency of alcohol use and higher relationship satisfaction than those who participated in other interventions (i.e., individual-based treatment [IBT] or a partner-involved psycho-educational attention control treatment [PACT] condition)
Study type/design	RCT with follow-up at one and every 3 months thereafter for 1 year.
Participant group	Heterosexual couples (N = 138) in which married or cohabiting women were entering outpatient treatment for an alcohol use disorder, female patients between 20 and 60yrs, married for at least 1 year or living with a romantic partner in a stable relationship for at least 2 years, meet DSM-IV alcohol abuse or dependence criteria.
Intervention	– Behavioural couples therapy (BCT) condition: 32 sessions, both partners attending 12 BCT treatment sessions together and in the remaining 20 sessions, female patients participated in individual, 12-step facilitation sessions for the treatment of alcoholism, which the non-substance-abusing male partners did not attend. In the 12 BCT sessions, the non-substance-abusing partner was an active participant in the intervention.
Comparator	– Individual-based treatment (IBT) condition. For the 32 sessions conducted as part of this condition, the non-substance-abusing partner did not participate in the intervention. Female patients were scheduled to attend all 32 sessions by themselves, and the intervention was carried out as an individual, 12-step facilitation treatment for alcoholism. Patients in this condition received the 20 individual-based sessions that were provided to substance-abusing patients in the BCT condition in addition to 12 other sessions with a 12-step facilitation focus. – Psychoeducational attention control treatment (PACT) condition. For the 32 sessions conducted as part of this condition, patients received the same 20 individual-based treatment sessions as those attended by female patients in the BCT and IBT conditions. In the remaining 12 sessions, both partners attended. However, as opposed to the BCT condition, the partners did not receive an active couples-based intervention. They were passive participants in 12 lectures about substance abuse.
Outcome definitions	– Urine and blood alcohol breath sample at each session – The Timeline Followback Interview uses a calendar and other memory aids to determine an individual's drinking and other drug use over a specified time period. – The substance use index measuring percentage of days abstinent (PDA). – The Drinker Inventory of Consequences: a self-report measure designed to provide a comprehensive and psychometrically sound measure of adverse drinking consequences. – Relationship adjustment: The Dyadic Adjustment Scale self-report measure of general relationship satisfaction. – The Marital Happiness Scale: 10-item scale that measures general happiness of partners within an intimate relationship.
Data analyses & statistics	Multilevel regression
Study quality (See below for A-G quality questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: Computer block randomised
	B. (1) Inadequate/Reported: Not possible
	C. (2) Adequate/Reported: Yes
	D. (2) Adequate/Reported: very specific
	E. (2) Adequate/Reported: Yes
	F. (2) Adequate/Reported: Yes
	G. (2) Adequate/Reported: Yes
	TOTAL: 13 points; Good.
Results (within scope of this review)	– No significant difference between BCT and IBT or PACT in terms of PDA status at post-treatment or linear rate of change in PDA during treatment (because all of the interventions were fairly effective in reducing reported drinking during treatment, with most patients in all conditions reporting abstinence or very low levels of drinking). – However, during the 12-month follow-up, female patients in BCT increased their drinking at a significantly slower rate (i.e., the slope for PDA during the follow-up period was significantly less negative) than female patients in IBT and PACT. – No difference between female patients who received IBT and PACT in rates of change in PDA during the post-treatment period.
Authors conclusions	– Our results indicate that BCT (plus the individual alcoholism counselling common to all

	<p>of the interventions) was significantly more effective in terms of improving outcomes along different dimensions of drinking behaviour and relationship adjustment than were the other treatment conditions. In particular, compared with female patients who received IBT or PACT, those who participated in BCT reported significantly fewer days of drinking and higher levels of dyadic adjustment during a 12-month post-treatment follow-up period. Additionally, the positive effects of BCT on drinking and dyadic adjustment were more enduring than the positive effects of IBT or PACT, as evidenced by the slower rate of return to drinking and slower reductions in relationship satisfaction during follow-up.</p> <ul style="list-style-type: none"> – Partner-involved interventions for dyads in which both partners misuse psychoactive substances need to be developed and evaluated to avail couples therapies to these dyads, and some researchers have argued that such an intervention needs to be substantially different than BCT, perhaps incorporating motivational interviewing methods or contingency management. – Given positive outcomes across multiple domains of functioning, BCT appears to be a very promising intervention for women seeking alcoholism treatment who are involved with non-substance-abusing partners.
Reviewers notes	A well designed study with use of discriminable treatments with extensive, well-developed manuals. This study provides good empirical support for the use of couple-based treatments in terms of improvements in primary targeted outcomes such as substance use and relationship adjustment, and also in other areas that are of clear public health significance, including intimate partner violence, children's adjustment, and cost-benefit and cost-effectiveness.
Relevance to study question	Neither of the control conditions compared support person vs no support person absolutely as although the individual intervention delivered the same content 'as near as possible' ... the absence of the partner meant that not all of the content could be delivered without the dyadic context and the reciprocity inherent in that context.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

- (A) Was the assignment to the treatment groups really random?
- (B) Was the treatment allocation concealed?
- (C) Were the groups similar at baseline in terms of prognostic factors?
- (D) Were the eligibility criteria specified?
- (E) Were the point estimates and measure of variability presented for the primary outcome measure?
- (F) Did the analysis include an intention-to-treat analysis?
- (G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

- Adequate/reported = 2
- Inadequate = 1
- Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

- An overall study score of 1-4 is rated Poor
- An overall study score of 5-10 is rated Fair
- An overall study score of 11-14 is rated Good

Abbreviations: BCT = Behavioural couples therapy, IBT = Individual-based treatment, PACT= Psycho educational attention control treatment, PDA = percentage of days abstinent

Citation	Gulliver, S. B., S. M. Colby, et al. (2004). "Tobacco cessation treatment for pregnant smokers: incorporating partners and incentives." <i>Medicine & Health, Rhode Island</i> 87(1): 9-12.
Level of evidence *	III-1
Country	USA
Research question/aims	Treatment for tobacco use disorder was conceptualized from a community reinforcement approach (CRA) model. This small pilot project sought to combine the strengths of previous research into one comprehensive yet inexpensive treatment program.
Study type/design	RCT pilot study
Participant group	Women (n = 20) 18 years and older were eligible if they were currently pregnant, smoking, and able to identify a partner to participate with them. Recruited via community news or flyers in physicians' offices
Intervention	<p>We postulated that: a) pregnancy presents a unique time for smoking cessation readiness; b) social support will promote and maintain change; c) incentive programs will reinforce change processes; d) functional analysis of smoking will aid cessation planning; e) brief groups will capitalize on social and professional resources; f) self-help materials will foster and maintain change; g) follow-up incentives will provide an effective on-going intervention.</p> <p>Incentives included strollers, car seats, and baby clothing, diapers, and infant toys, gift certificates for department stores, grocery stores, movies, haircuts, housecleaning and massage.</p> <p>Participants were randomly assigned to the "partner" or "no partner" groups at the baseline meeting. The group counselling session took place the following week. Functional analysis was used to design an individualized behaviour change plan</p> <p>A 60-minute manual-guided session conducted by a clinical psychologist. The intervention began with a "win" message to participants-that quitting smoking was possible, and that it would improve their lives and the health of their babies. Women (and partners) introduced themselves and described their experience with smoking and previous attempts to quit. Next, the program components were reviewed. Participants were told that the counselling session would involve a review of the self-help manual ("Freedom from Smoking for You and Your Baby), 11 a functional analysis of smoking behaviour, and the development of a quit smoking contract.</p> <p>Regular check-ins throughout the pregnancy and the first three months of their infants' lives. They were informed that research had demonstrated that brief contact with health care professionals increases quitting success. Every time a participant attended, moreover, she received a raffle ticket; and every third month, a drawing was held for a car seat. Enrolment in the raffle occurred irrespective of smoking status. Participants were told, "Every time you are smoke free, by your self-report and your CO reading, you will earn a coupon that you can use for one of the items on this list. These items have been donated by members of the community - local manufacturers, businesses, and individuals who want to support you in your efforts to remain smoke-free. All items are brand new."</p> <p>Therapist led participants through the self-help manual for about 20 minutes.</p> <p>Participants (and partners if included) then constructed plans for (a) coping with triggers, (b) substitution of other immediate reinforcers, and (c) a meaningful list of long-term positive consequences of quitting smoking.</p> <p>When the group included partners, a tip sheet describing partner support and effective communication was distributed and reviewed, and participants and partners outlined and agreed to appropriate support for the planned smoking cessation. Emphasis was placed on positive reinforcement methods. At the close of the session, a quit smoking contract was completed.</p> <p>SELF-HELP MANUAL</p> <p>The "Freedom from Smoking for You and Your Baby," manual 11 was chosen based on research demonstrating that the provision of standard clinic information, in addition to advice to quit, and a pregnancy-specific manual was more effective than the same treatment with a non-pregnancy specific manual or standard clinic information and physician advice alone. 12 The manual details a 10-day stop smoking program that provides pregnant smokers with structured recommendations for each day of the program.</p> <p>FOLLOW-UP CONTACT</p> <p>Following baseline intervention, participants returned monthly until three months after the birth of their child. At these visits, the participant met with a research assistant who collected smoking data (self-report and CO) and conducted the follow-up intervention.</p>

	Regardless of their smoking status, participants earned raffle tickets for attending follow-up visits. A new car seat was raffled off every 3 months. Participants demonstrating abstinence by self-report and CO level were given a coupon, which could be exchanged for a small incentive or accumulated for larger incentives. If a participant was not abstinent, the research assistant completed a functional analysis with her, and a new contract to quit. The research assistant used an intervention style consistent with principles of motivational enhancement.
Comparator	As above but with partner participation
Outcome definitions	At baseline, women completed a demographic questionnaire, the Fagerstrom Test of Nicotine Dependence 13, a smoking history questionnaire, and measures of self-efficacy, partner support, reasons for smoking, and stage-of-change. Smoking abstinence was defined as expired CO < 10ppm on a Bedfont CO monitor.
Data analyses & statistics	Not described
Study quality (See below for A-G quality criteria questions†, scores‡ and total/rating§)	A. (2) Adequate/Reported:
	B. (1) Inadequate:
	C. (2) Adequate/Reported:
	D. (2) Adequate/Reported
	E. (2) Adequate/Reported: Yes
	F. (2) Adequate/Reported: Yes
	G. (2) Adequate/Reported: Yes
	TOTAL: points; .
Results (within scope of this review)	With regard to partner participation, women who participated in treatment with their partner were significantly more likely to quit on their scheduled quit date, $[\chi^2(1, N=20) = 4.4, p < .05]$ and to remain quit at one-month follow-up, $[\chi^2(1, N=20) = 4.4, p < .05]$ compared to those women who received treatment without the involvement of their partners. Sixteen of the twenty participants returned for follow up. Follow-up rates were equal in the partner-included and no-partner conditions, and those lost to follow up were considered on-going smokers. Overall, 54% of participants reported quitting smoking on their quit date and continuing to abstain from smoking at one-month follow-up
Authors conclusions	This small pilot project sought to combine the strengths of previous research into one comprehensive yet inexpensive treatment program. Support from the health-care community was enlisted for recruitment and the business community contributed incentives. A group counselling session with a trained professional guiding participants in the use of a self-help manual was combined with the incentive program and repeated follow-up contact. In 50% of the cases, partners were asked to participate in the cessation program. Inclusion of a partner in the program improved outcome. The results demonstrate that it is possible to enlist a community's support in creatively funding such smoking cessation interventions. About one-third (31%) of local business owners approached agreed to contribute resources as incentive for cessation, and the vast majority of health practitioners agreed to refer participants. Finally, the role of pregnant women's partners in supporting their ability to quit smoking appears important. Even in this small sample, inclusion of partners in the smoking treatment led to better smoking cessation rates. Partners generally were interested in helping. Pregnancy is a time of unique opportunity for change, a sentiment not lost on communities that wish to support healthy lifestyles. The benefits of including the broader community, the immediate support network, and consistent long-term attention to the pregnant smoker merit additional investigation.
Reviewers notes	incentives (raffle tickets for car seats) for attending, regardless of smoking status was aimed at retention rather than treatment effect
Relevance to study question	

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†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

(E) Were the point estimates and measure of variability presented for the primary outcome measure?	– An overall study score of 1-4 is rated Poor
(F) Did the analysis include an intention-to-treat analysis?	– An overall study score of 5-10 is rated Fair
(G) Were withdrawals and dropouts completely described?	– An overall study score of 11-14 is rated Good

Abbreviations:

Citation	Keogh, K. M., S. M. Smith, et al. (2011) Psychological family intervention for poorly controlled type 2 diabetes. The American journal of managed care 105-113
Level of evidence *	II
Country	Ireland
Research question/aims	To evaluate the effectiveness of a psychological, family-based intervention to improve diabetes-related outcomes in patients with poorly controlled type 2 diabetes.
Study type/design	RCT: 6-month prospective stud, patients were randomly allocated to an intervention group (n = 60) or control (n = 61).
Participant group	Participants: Patients were included in the study if they had type 2 diabetes for more than 1 year, were over 18 years old, and had persistently poor glycemic control, defined as having at least 2 of their last 3 glycated hemoglobin (A1C) readings at 8.0% or higher. Support people: Family members were defined as those having a close relationship and regular contact with the patient, although they were not required to be living with patients or to be a blood relative (eg, a close friend could participate).
Intervention	Usual care + 3 weekly sessions (45 minutes each) delivered by a health psychologist The first 2 sessions took place in the patient's home with their family member (buddy). The third session involved a 10-to 15-minute follow-up telephone call. The intervention used techniques from health psychology and motivational interviewing.
Comparator	Usual care
Outcome definitions	Glycated haemoglobin (A1C) readings, and self-reported beliefs about diabetes, psychological well-being, diet, exercise, and family support.
Data analyses & statistics	Regression modelling, all analyses were intention-to-treat
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/rating§)	A. (2) Adequate/Reported: Yes computer-generated
	B. (1) Inadequate: Not possible
	C. (2) Adequate/Reported: no baseline differences
	D. (2) Adequate/Reported: Yes
	E. (2) Adequate/Reported: Yes
	F. (2) Adequate/Reported: Yes
	G. (2) Adequate/Reported: Yes
	TOTAL: 13 points; Good.
Results (within scope of this review)	At 6-month follow-up, the intervention group reported significantly lower mean A1C levels than the control group (8.4% [SD = 0.99%] vs 8.8% [SD = 1.36%]; P = .04). The intervention was most effective in those with the poorest control at baseline (A1C >9.5%) (intervention 8.7% [SD = 1.16%, n = 15] vs control 9.9% [SD = 1.31%, n = 15]; P = .01).
Authors conclusions	Findings suggest that a psychological family-based intervention for patients with poorly controlled type 2 diabetes led to improvements in glycemic control, diabetes perceptions, psychological well-being, self-management behaviours, and family support. However, both groups continue to have unacceptably high A1C levels at follow-up, with neither group achieving optimal glycemic control targets.
Reviewers notes	Tests a buddy-MI intervention against usual care.
Relevance to study question	Yes included objective and subjective measures.

* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Citation	Morgan, P. J., D. R. Lubans, et al. (2011). "The 'Healthy Dads, Healthy Kids' randomized controlled trial: efficacy of a healthy lifestyle program for overweight fathers and their children." <i>International Journal of Obesity</i> 35(3): 436-447.
Level of evidence *	II
Country	Australia
Research question/aims	To evaluate the feasibility and efficacy of the 'Healthy Dads, Healthy Kids' (HDHK) program, which was designed to help overweight fathers lose weight and be a role model of positive health behaviours for their children.
Study type/design	RCT: Fathers and their school-aged children were randomly assigned in family units.
Participant group	A total of 53 overweight/obese men and their primary school-aged children
Intervention	Fathers in the 3-month program attended eight face-to-face education sessions. Children attended three of these sessions. The total program contact time was 600 min. Key Social Cognitive Theory variables were targeted and operationalised, including self-efficacy, outcome expectations, self-monitoring, goal setting, perceived facilitators and barriers to changes, role modelling and social support AND aligned with theoretical constructs using the taxonomy of behaviour change strategies identified by Abraham and Michie. Sessions that included the child included practical Fitness, fun and fundamental movement skills (FMS), FMS circuit, Rough and tumble activities, 'Playing strong' and Partner fitness challenges and Ball and game skills.
Comparator	Wait-list control
Outcome definitions	The primary outcome was fathers' weight. However, Fathers and their children were assessed at baseline, and at 3- and 6-month follow-up, for weight, waist circumference, BMI, blood pressure, resting heart rate (RHR), objectively measured physical activity and self-reported dietary intake.
Data analyses & statistics	Analyses were performed separately for fathers and children using Mixed models and effect sizes were determined using Cohen's d.
Study quality (See below for A-G quality criteria questions†, criteria scores‡ and total/ rating§)	A. (2) Adequate/Reported: Yes computer-generated
	B. (1) Inadequate: Not possible
	C. (2) Adequate/Reported: no baseline differences
	D. (2) Adequate/Reported: Yes
	E. (2) Adequate/Reported: Yes
	F. (2) Adequate/Reported: Yes
	G. (2) Adequate/Reported: Yes
	TOTAL: 13 points; Good.
Results (within scope of this review)	HDHK fathers losing more weight (-7.6 kg; 95% confidence interval (CI) -9.2, -6.0; d=0.54) than control group fathers (0.0 kg; 95% CI -1.4, 1.6). In children, significant treatment effects (P<0.05) were found for physical activity (d=0.74), resting heart rate (d=0.51) and dietary intake (d=0.84).
Authors conclusions	The HDHK program resulted in significant weight loss and improved health-related outcomes in fathers and improved eating and physical activity among children. Targeting fathers is a novel and efficacious approach to improving health behaviour in their children.
Reviewers notes	<p>Family Systems Theory postulates a complex theoretical framework of reciprocal relationships among family members. That is, when a parent changes his or her physical activity and dietary behaviour, this will be reflected in the child's behaviour.</p> <p>The significant improvements in health-related outcomes and physical activity for fathers may be attributed to the fact that fathers were instructed and encouraged to role model these healthy behaviours for their children and this is likely to have acted as an additional source of motivation. Similarly, children were also taught to role model and encourage their fathers to adopt healthy behaviours. According to Bandura, this reciprocal reinforcement between family members is particularly important when changing and sustaining new behaviours. That is, both fathers and children mutually reinforced healthier behaviours.</p> <p>The HDHK program is the first study to exclusively target overweight fathers to improve their weight profile, physical activity and dietary behaviour to positively influence the physical activity and eating behaviour of their children. The HDHK program was unique in that it was designed to engage fathers as key agents of behavioural change in their families.</p> <p>The importance of engaging fathers is not yet a strongly held view in public health. Mostly, interventions tend to focus on the mother's involvement as critical and this 'mothercentric' perspective is challenged in this study. Future family-based programs should consider how best to include and engage fathers and mothers in obesity treatment and prevention interventions to optimize the effectiveness of programs in reducing obesity-related risk factors in the long term.</p>
Relevance to study	Although this study design did not set out to test the 'buddy' vs 'no buddy' question

question	directly, conceptually, the father-child dyad was a key component of the intervention both practically and conceptually/theoretically ... as compared to the 'non buddy' / no intervention control group. This interaction is further evidenced by the significant changes in outcome(s) for both father and child. The intervention did involve purposely pairing two individuals and specifically incorporating social support and is a form of buddy-system (albeit not as overtly as in many other intervention designs). In this intervention the 'subject' (father) is not 'supported' directly by a selected or assigned motivational-buddy, rather the natural pairing within the family unit is utilised and the social support can be seen to operate in both directions via modelling. The intervention could moreover be conceptualised as a 'child' or 'father' intervention although it is described here as targeting fathers' weight with the inclusion of the 'significant other' (the child) being an adjunct or component within a multi-component intervention. The results detail clinical outcomes that are certainly meaningful.
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* As per NHMRC Interim Levels of Evidence (NHMRC 2005) for Evaluating Intervention Studies

†The quality of the study was assessed using the following questions:

(A) Was the assignment to the treatment groups really random?

(B) Was the treatment allocation concealed?

(C) Were the groups similar at baseline in terms of prognostic factors?

(D) Were the eligibility criteria specified?

(E) Were the point estimates and measure of variability presented for the primary outcome measure?

(F) Did the analysis include an intention-to-treat analysis?

(G) Were withdrawals and dropouts completely described?

‡ For each individual answer, the following scores were assigned:

Adequate/reported = 2

Inadequate = 1

Unknown/not reported = 0

§ The following thresholds for study quality have been applied:

– An overall study score of 1-4 is rated Poor

– An overall study score of 5-10 is rated Fair

– An overall study score of 11-14 is rated Good

Abbreviations:

13.3 Search strategy

Global Health search strategy:

- 1 support systems/ or personal support networks/ (1065)
- 2 ((social or friend* or peer*) adj3 (support* or network*)).tw. (4967)
- 3 (support adj3 network*).tw. (654) INTERVENTIONS
- 4 1 or 2 or 3 (5608)
- 5 weight losses/ or weight reduction/ (10059)
- 6 smoking cessation/ or tobacco smoking/ (22511)
- 7 health behaviour/ (3206) HEALTH BEHAVIOUR
- 8 5 or 6 or 7 (35033)
- 9 4 and 8 (492)
- 10 limit 9 to (english language and yr="1995 -Current") (464)

Medline strategy:

- 1 exp Self-Help Groups/ (8347)
- 2 social support/ (45916)
- 3 ((social or friend* or peer) adj3 (support* or network*)).tw. (27316)
- 4 support network*.tw. (1466) INTERVENTIONS
- 5 or/1-4 (65594)
- 6 exp Body Weight/ or Weight Loss/ (318767)
- 7 "Tobacco Use Disorder"/ or Smoking/ or Smoking Cessation/ (120114)
- 8 Motor Activity/ (69142)
- 9 exp Drinking Behavior/ (52170)
- 10 alcohol-related disorders/ or alcoholism/ (66552)
- 11 physical activit*.ti. (14532) HEALTH BEHAVIOUR
- 12 or/6-11 (588951)
- 13 5 and 12 (5460)
- 14 Health Behavior/ (28638)
- 15 behav* change.ti. (1186)
- 16 evaluation studies as topic/ or program evaluation/ (160230)
- 17 (program* or intervention or effective*).ti. (244294) TERMS TO
CAPTURE EVALUATION STUDIES AND BEHAVIOUR CHANGE
- 18 or/14-17 (410665)
- 19 13 and 18 (1286)
- 20 limit 19 to (english language and yr="1995-current") (995)
- 21 (letter or editorial).pt. (1063699)
- 22 20 not 21 (982)

Cochrane strategy:

- #1 ((social or friend* or peer*) near (support* or network)):ti,ab (1844)
- #2 buddy:ti,ab (41)
- #3 (support near/2 networks):ti,ab (73)
- #4 (social near/2 relationships):ti,ab (134)
- #5 ((support near/2 network) near/3 (intervention*)) (5)
- #6 (“significant others”):ti,ab (34920)
- #7 (behave* therapy):ti,ab (48)
- #8 ((weight loss*) or (weight reduc*)):ti,ab (14588)
- #9 ((smoking cessation) or (tobacco smoking)):ti,ab (4373)
- #10 (health next behavi*):ti,ab (715)
- #11 (behav* near change):ti,ab (3353)
- #12 diabet*:ti,ab (23202)
- #13 body weight:ti,ab (16305)
- #14 ((tobacco use disorder) or (smoking) or (smoking cessation)):ti,ab (10512)
- #15 ((motor activit*) or (physical activit*)):ti,ab (8103)
- #16 drinking behave*:ti,ab (11)
- #17 alcohol-related disorders):ti,ab (57)
- #18 (Behav* near/2 change):ti,ab (2089)
- #19 diabet*:ti,ab (23202)
- #20 exercise:ti,ab (27491)
- #21 ((“heart failure”) or (“heart disease”) or (“cardiovascular disease”) or (“coronary heart disease”)):ti,ab (21987)
- #22 (program* or intervention or effective*):ti (49322)
- #23 #1 or #2 or #3 or #4 or #5 or #6 or #7 (36788)
- #24 #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 (99292)
- #25 #23 or #24 (36788)
- #26 (program* or intervention or effective*):ti (49322)
- #27 #23 and #26 (2843)
- #28 #24 and #26 (10596)
- #29 #27 and #28 (**931**)

14 Appendix F

1. Copyright notice
2. Original publication

Brinson, Wallace-Bell, Kirk, & Hornblow (2013).

14.1 Original publication

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Buddy-Motivational Interviewing (buddy-MI) to Increase Physical Activity in Community Settings

Study Protocol for a Pragmatic Randomised Controlled Trial

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Study protocol

buddy-Motivational Interviewing (buddy-MI) to increase physical activity in community settings: study protocol for a pragmatic randomised controlled trial

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Abstract

This article describes the development and evaluation of a novel buddy-Motivational Interviewing intervention intended to help apparently healthy but relatively sedentary adults to adopt and maintain regular physical activity for health and fitness. Many people experience great difficulty in initiating physical activity (“the getting going problem”) and behavioural regression is common (“the keeping it going problem”). Typically there is a rather large gap between what people know to be healthy and what they actually do. This intervention is an adaptation of usual care Motivational Interviewing in that it adds client-selected motivational-buddies who can provide in-session input as well as ongoing out-of-session support focused on strengthening client’s motivation for and movement toward their physical activity goals. A pragmatic parallel group randomised controlled trial with 12-month follow-up aims to deliver the intervention in a format that could realistically be implemented within primary care, workplaces, schools or other similar setting. The study is due to report clinical effectiveness findings in 2014.

Background

Significant changes in the demographic profile of New Zealand will result in fewer children, more older people and further ageing of the population. Half of New Zealand's population will be 46 years and older by 2051, compared with a median age of 35 years in 2004 (Statistics New Zealand, 2004). For health services, this is significant in two fundamental ways: firstly health service utilisation is greatest in the first few and last few years of life, and secondly, these shifts in the demographic profile will also be reflected across the health workforce, potentially resulting in large unsustainable losses of health care professionals. In short, the increasing demand for resources is likely to significantly outstrip the available capacity in the not too distant future. Compounding these demographic factors, the increasing trend in life expectancy in New Zealand is not paralleled by improvements in morbidity: due largely to the progression of non-communicable (lifestyle) diseases, particularly coronary heart disease, obesity and Type 2 diabetes (Ministry of Health, 2001, 2005). Inactive and unfit people have almost double the risk of dying from coronary heart disease compared with more active and fit people (Kohl, Gordon, Villegas, & Blair, 1992; Lee & Skerrett, 2001).

Most New Zealanders are exposed to increasingly obesogenic environments and the adverse effects, the so called lifestyle diseases, are now obvious. However, engaging in regular moderately vigorous physical activity can go some way towards offsetting these adverse effects and the health benefits of regular physical activity are well documented for all age groups (Bouchard & Shephard, 1994). Early studies conducted by Jeremy Morris and his colleagues (Morris, Heady, Raffle, Roberts, & Parks, 1953; Morris, Kagan, Pattison, & Gardner, 1966; Paffenbarger & Hale, 1975; Paffenbarger, Wing, & Hyde, 1978) demonstrated the so called independent protective effect of moderately vigorous or vigorous exercise via the series of groundbreaking prospective cohort studies. Moderately vigorous physical activity is positively linked via a cause-and-effect relationship with a range of improved health outcomes (Lee & Skerrett, 2001) and this relationship is now widely understood and accepted. However, despite the benefits of being more active, most lay-people, researchers and health professionals would agree that sustained individual-level behaviour change remains very challenging.

Trends in physical activity promotion

There is growing recognition that health behaviour change is more likely to occur and endure when an individual's environment is supportive of change (McLeroy, Bibeau, Steckler, & Glanz, 1988). Social-ecological perspectives recognise that society is composed of interconnected elements: individual level, interpersonal, organisational, community, and social and that these invariably influence one another. Therefore, people who are attempting change are influenced not only by their immediate settings but also by the larger social contexts (both formal and informal) in which these settings are embedded (Brofenbrenner, 1977). There is a growing recognition that it is not particularly helpful to view health problems as residing solely within individuals and quality contemporary health promotion programmes are

tending towards a systems approach. A systems approach to physical activity promotion might include community-wide campaigns, point-of-decision prompts, school-based programmes, workplace programmes, social support interventions in community settings, enhanced access to places for physical activity, urban design/land-use policies and modification to the built environment (Centers for Disease Control and Prevention, 2008).

Intervention at the population level is important in the overall effort to change sedentary lifestyles. Targeted, well-executed population level campaigns can have small-to-moderate effects not only on health knowledge, beliefs, opinions and attitudes, but also on behaviours as well (Noar 2006). A meta-analysis of health campaign effects on behaviour by Snyder and Hamilton (2002) found effect sizes in the range of 0.17 (SD=0.02) for those using a law enforcement message (e.g. seatbelts) to fairly small effects 0.05 (SD=0.04) for those not using enforcement messages (e.g. fruit and vegetable consumption, exercise and weight). While the effects might be small for these health promoting behaviours, they are not unimportant because they potentially reach a large number of people and cumulatively, they add up (Glasgow, 2002).

At the individual level, education and brief psychosocial/psychological interventions have been shown to be useful in many areas of health behaviour change: including smoking cessation, changes in nutrition, physical activity and compliance with medication protocols (Burke, Dunn, Atkins, & Phelps, 2004; Gonder-Frederick, Cox, & Ritterband, 2002; Pringle, Gilson, McKenna, & Cooke, 2009). Notwithstanding the successes, neither population level interventions nor individual level interventions guarantee health behaviour change. For a variety of reasons, programmes often struggle to deal adequately with individual differences in readiness and willingness to change, cultural appropriateness, barriers to equitable access, and a myriad of other socioeconomic, cognitive and psychological factors (Fuchs, 1998; Ministry of Health, 2002). Health behaviour change remains extremely challenging and change is often not maintained much beyond the intervention period, and there is the persistent tendency for behavioural-regression and rebounding (Gonder-Frederick, et al., 2002; McKinlay, 1993). While it is true that modern medicine has evolved to ameliorate many acute illnesses and injuries, it still performs rather less well when faced with the increasing prevalence of lifestyle diseases (Callahan, 2009; Fuchs, 1993, 1998; McKinlay, 1993) and the multi-faceted determinants of health that lie outside of individuals' human biology (Lorig & Holman, 2003).

Most would agree that a 'magic bullet' is unlikely. In attempts to address the particular limitations of both population level and individual level interventions, contemporary perspectives recognise the need for multi-level approaches, sustained over years not months, and the need for multi-sectoral policies to promote physical activity. Such multi-sectoral policies include

promoting enabling environments, community involvement, and individual-level intervention (World Health Organization, 2004).

Rationale

This current trial acknowledges recent trends in physical activity promotion and aims to bridge between the individual-level and wider social networks (the inter-personal level) by formally invoking social support via the use of self-selected motivational-buddies. The head-to-head trial has been designed to test a novel adaption of Motivational Interviewing (MI) (Miller & Rollnick, 2002) against usual-care MI, in a physical activity counselling intervention potentially feasible for use in primary care and community settings. The primary outcomes of interest are self-reported physical activity, cardiorespiratory fitness, and Health Related Quality of Life (HRQOL). Physical activity reflects the behavioural aims of the intervention and cardiorespiratory fitness reflects the down-stream physiological adaptations that may lead to potentially significant health benefits. Also important, HRQOL reflects the psychological aims of the intervention as the HRQOL construct includes the domains role-emotional; vitality; social function; and mental health. The concept of HRQOL acknowledges that people rate their actual situation in relation to their individual expectations.

There is a paucity of evidence for the incremental effectiveness of buddy versus non-buddy interventions in health-care and this trial aims to add knowledge in this domain. Given the ever present demand for health services and the complex interactions of demand, access, cost and quality; learning how to maximise efficiency in the use of scarce resources is an important research goal.

Why Motivational Interviewing?

Motivational interviewing (MI) has become a well-recognised style, method or technique of client-centred counselling and the application of MI continues to grow at a rapid pace. Only a brief description of MI is given here as many other sources provide thorough explanations and descriptions of its application in health-care and other settings (Arkowitz, 2008; Miller & Rollnick, 2002, 2009; Miller & Rose, 2009; Rollnick, Miller, & Butler, 2008) and the experimental intervention used in this trial is described in detail below. A central tenet of MI is that the intervention is collaborative in nature and defined by a partnership between the practitioner and the client. Fundamentally, MI involves the activation of peoples' own motivation for change and MI involves a guiding style with the practitioner actively engaged in eliciting the client's intrinsic motivations for change.

There is now considerable evidence (over 160 randomised trials) for the effectiveness of MI in the treatment of substance abuse, as well as a number of other settings and problem areas including family practice, chronic care, diabetes, cardiac rehabilitation, oral health (emerging) and diet and exercise. Several systematic reviews and meta-analyses of MI have now been published

(Burke, Arkowitz, & Menchola, 2003; Hettema, Steele, & Miller, 2005; Lundahl, Kunz, Brownell, Tollefson, & Burke, 2010; Martins & McNeil, 2009; Vasilaki, Hosier, & Cox, 2006) and these generally report positive small-to-medium but clinically significant effects (Abbott & Freeth, 2008).

A broad range of literature was consulted during the design and refinement of the buddy-MI intervention and in the development of the training resources: including the work of Bandura (1977) on social cognitive theory; Christakis and colleagues (Christakis & Fowler, 2007) network effects and health outcomes; Magill et al. (2010) motivational interviewing with significant other participation; Moyers et al. (Moyers, Martin, Manuel, Miller, & Ernst, 2007; Moyers, Martin, Manuel, Miller, & Ernst, 2010) client language and Miller and Rollnick (2002) and Rollnick et al. (2008) for a general overview of MI and its application in health-care settings.

Why a buddy intervention?

The concept of the buddy-system is not new and buddy systems are used formally or informally across a variety of settings ranging from school groups to high hazard workplaces (e.g. search and rescue), the armed forces, business (e.g. mentoring) and health-care (for example see May & West 2000, for a review of buddy-systems in smoking cessation). Buddy systems generally operate so that two people work together and are able to monitor and help each other, usually for the purpose of orientation or providing support, mentoring, enhancing safety, learning, or motivation, or a combination of these (see also Hurdle 2001, for a review of social support in health promotion).

While there is no standardised functional definition of a motivational-buddy, in this trial, the buddy role is described as exerting influence in two separate but related domains: the in-session domain comprising the structured MI part of the programme and secondly, the out-of-session domain which comprises all other buddy-to-client interactions. Within this framework, the support person or motivational-buddy ideally serves the function of a counselling-buddy (technically a motivationally consistent buddy within the spirit of MI) as well as the more usual emotional/practical support role common to most buddy systems (help with tangible needs, e.g. providing feedback and advice or being an exercise partner or providing other inputs of time and effort or other material resources). Buddies may vary in terms of their enthusiasm, conscientiousness, communication skills, empathy, and availability and generally in the level of support provided. Attempting to positively influence and enhance the supportive relationship between the buddy and the client is therefore another important component of the intervention (see below for more details). However, the goal is not to transform buddies into competent MI therapists, but to guide buddies towards being motivationally consistent in their interactions and on the whole adherent to MI fundamentals: to demonstrate the spirit of MI.

The buddy-intervention aims to bridge between the individual level of intervention and the wider community. Individual level interventions are often resource-limited in their ability to maintain long-term support and they often don't link-in directly with wider social networks and whānau. The buddy-intervention seeks to address these common limitations by engaging non-health professionals to provide intervention components and ongoing support, with the potential for favourable ripple and inter-personal effects. Consideration has been given to the cultural appropriateness of the intervention, in accordance with the Treaty of Waitangi (New Zealand's founding document) and the focus on partnership is viewed as an important strength.

Methods

Design

Quantitative research methods will be used: based on a pragmatic, parallel group randomised controlled trial (RCT). Blinding the investigator and/or the participants to the treatment received is not possible. Qualitative exit survey data will supplement the findings and provide information on various process outcomes. All procedures were reviewed and approved by the University of Canterbury Human Ethics Committee.

Hypotheses

The study aim is to investigate the relative effectiveness of MI delivered in a buddy-system context as compared to treatment-as-usual one-on-one Motivational Interviewing. The main hypothesis to be tested is that participants in the experimental group will self-report relatively higher levels of physical activity, cardiovascular fitness and health related quality of life at follow-up as compared with control group participants.

Setting

The study will be conducted in Christchurch New Zealand at the University of Canterbury. The University has nearly 19,000 enrolled students, including over 2,000 international students from more than 80 countries and approximately 800 academic staff.

Participants

Volunteer adults ($n = 60$), apparently healthy, relatively physically inactive but able to increase their physical activity. Potential participants will be excluded if in unstable health or if physical activity is contraindicated.

Recruitment and randomisation

Participants will be recruited via advertising flyers and other opportunistic recruitment. The study is presented as fundamentally a study of MI with a focus on physical activity and both interventions are presented as real and active therapies. A two-step consent/randomisation strategy is intended to reduce rates of non-compliance and drop-out in the control group by

reducing the possibility of resentful demoralisation. Block randomisation will be used via the sealed envelope method (Roberts & Torgerson, 1998).

The experimental intervention

Background and rationale

MI involves the conscious, disciplined and flexible use of specific communication principles and strategies to evoke a person's own motivations for change. Emphasis is given to the underlying spirit of MI which can be summarised as partnership (an even power relationship and a joint decision making process), autonomy (honouring client autonomy/a detachment from outcome), compassion (unconditional positive regard) and evocation (the process of bringing to mind and harnessing what people already have) (Miller, 2010; Miller & Rollnick, 2002; Miller & Rose, 2009). MI involves a number of micro-skills including open questions, affirming, reflecting and summarising (OARS) within an overarching process of engaging, focusing, evoking and planning- and this process can be tailored depending of the needs of the client and the context (Miller, 2010; Miller & Rollnick, 2002). An MI therapist can also use a range of strategies including agenda-matching, pros and cons, importance and confidence scaling questions, envisioning, rolling with resistance, brainstorming and planning. Another important therapist skill is the ability to resist the righting reflex: the impulse to adopt the expert role and forge ahead of the client in an effort to fix the problem (Miller & Rollnick, 2002).

Motivational interviewing differs from traditional biomedical counselling with regard to the guiding style of interaction- in addition the development of discrepancy, supporting self-efficacy, the expression of empathy, empowerment, and encouraging hope and optimism are also components of good MI practice. MI has the potential to facilitate long-term exercise behaviour change and positively influence peoples' health, however as Miller and Rollnick (2009) point out, "If someone genuinely has no inherent motivation for making a change, MI cannot manufacture it" (p.131).

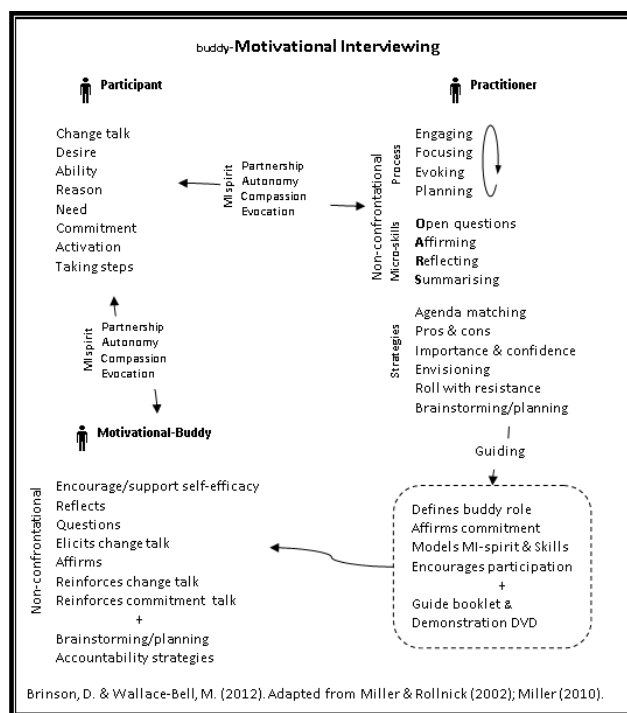


Figure 1: Schematic of proposed buddy-MI intervention, adapted from Miller and Rollnick (2002), Miller (2010) and other related materials.

Motivational Interviewing, as interpreted and adapted here, forms the basis of the proposed buddy-MI intervention model (Figure 1). In buddy-MI the therapist primarily delivers MI but also works with the participant (client) and his/her motivational-buddy to build a therapeutic relationship in which different basic elements of social exchange such as support, reciprocity, accountability and role-modelling may occur and can potentially be channelled to positive effect. Prior to any in-session time, the buddy is provided with background information describing the buddy-role and a range of training resources (as described more fully below). Generally, the focus of the motivational interviewing sessions is on engaging the client and their motivational-buddy in discussions about change, exploring ambivalence about exercise habits, eliciting change talk and commitment language, and planning and discussing how behavioural changes might fit an individual's vision for the future and their personal values.

Intervention specifics

Participants (clients) in the experimental group will be offered face-to-face buddy-MI and follow-up for a period of 12-months and the MI sessions will be conducted with the client's self-selected motivational-buddy participating. The protocol does not set parameters within which the buddy pair is expected to fit and clients are invited to self-recruit their best choice or best fit buddy. The frequency, timing and duration of the treatment will largely be determined by the participants. Ordinarily, within a 50-minute hour format, it is expected that the intervention will fill a minimum of two sessions (<1-2hrs) and a

maximum of three to five sessions (2–4 hrs) spread over the 12-month intervention period. For all participants, two initial sessions of MI will be booked approximately a fortnight apart, but beyond this, the participants will be invited to schedule further sessions to suit their individual needs. Follow-up emails are scheduled for one or two days after each and every session. These follow-up emails take the form of a personalised note thanking the client/buddy for their participation and confirming the next appointment time. Each follow-up note also includes one complex reflection and an affirmation relating to a key point from the previous MI session.

Within buddy-MI sessions, the buddy will be encouraged to adopt a non-confrontational communication style, offer reflections on client or therapist statements, question, affirm, support and reinforce change and commitment statements and/or assist with brainstorming and planning. Instruction and guidance in these skills is provided both in the buddy learning package and via in-session modelling by the therapist. The role of the buddy outside of the session time is to be determined entirely by the client-buddy pair (with guidance provided if requested).

The intervention will not follow any specific written therapist manual but as outlined in detail elsewhere (Miller & Rollnick, 2002), MI can involve a range of standard strategies to elicit change talk including importance and confidence scaling, pros and cons, envisioning and planning for change. Buddy specific adaptations of these standard MI strategies have been tested for feasibility: pilot study video recordings of client/buddy responses were reviewed and coded with the MISO instrument (Apodaca, Manuel, Moyers, & Amrhein, 2007) to guide practitioner training. These adaptations generally take the form of asking the buddy to provide an additional perspective of the client or to relay their observations of the client's past challenges, efforts or achievements (often buddies provide these un-prompted). For example, the adaptation of confidence scaling involves asking the buddy to rate their perception of the client's ability to take steps towards change (on a scale of 1 to 10). In pilot testing, this more often than not resulted in the buddy scoring the client more highly on the confidence scale and going on to reflect, reinforce, and affirm the client's personal strengths, past achievements and steps already taken towards change. Initial review of pilot session recordings has shown that these buddy-reinforcements and buddy-affirmations commonly elicit client change talk and commitment talk. Eliciting client change talk and commitment talk is generally the objective of using specific strategies in MI, and in the buddy-MI adaptation, an additional opportunity is created to elicit and reinforce desire, ability, reason and need statements and to introduce and reinforce positive client attributes.

Agreement between the client and buddy to work on a change-plan or to develop an exercise schedule was another common outcome during the pilot interviews: this commitment to planning is commonly initiated collaboratively by the client or buddy rather than by the therapist. Brainstorming and

elaborating on the types of out-of-session interactions and the style of communication/accountability that might serve to strengthen the buddy relationship was another common discussion theme. The therapist is thus presented with additional opportunities to reflect, affirm and selectively reinforce these buddy/client utterances.

Finally, another common theme recorded in the pilot interviews was accountability. Accountability is a component of social engagement that has been used to describe any implied or explicit understanding between two people or any rules and expectations that orient the agent's behaviour (the client) to the role enacted by the overseer (the buddy) (Sharpe, 2000). According to this understanding of accountability, if a client and a buddy establish a relationship based on trust and expected conduct, then a link will be formed between accountability and individual conscience. Client initiated discussions around accountability appear to be common in the buddy-Motivational Interviews and these may exert a motivational influence, although the operationalisation and measurement of accountability and its possible incremental benefits within buddy-MI is beyond the scope of this current research.

Development of buddy-Motivational Interviewing training resources

During the preliminary stages of the buddy-MI pilot, post-session feedback was sought from participating buddies. Buddies typically reported that they were unsure of exactly what their role was and what was expected of them. Attempts to briefly coach buddies in their role and in MI spirit and micro skills, prior to sessions, proved unsuccessful due to the lack of time to adequately cover the material. As a result of this feedback it became apparent that a more comprehensive approach was required. Further work focused on producing two resources, firstly a guide-book, *Buddy basics: Information for motivational-buddies* and *Buddy-basics: an instructional video for motivational- buddies*.

Firstly, the information booklet includes introduction and background information and describes the rationale for the study. The content also includes an introduction to the concepts of peer-influence, social networks and their possible effects on health outcomes and an outline of desirable buddy-skills/style along with specific practical examples. The booklet was trialled with buddies and feedback was sought on the content. The booklet was also peer-reviewed by the study supervisors and revisions were made to incorporate all the inputs and to simplify and condense the text.

The second resource, the instructional DVD, was developed in two parts. Part one involved developing a voice-over script and a set of slides and graphics to depict a motivationally adherent communication style, the fundamentals of behaviour change, and the buddy role. Specifics include a description of a non-judgmental guiding style, the idea of change vs. status quo, the relevance of personalised goals and values, useful ways to give advice and information

(using conditional language) and the importance of avoiding any type of confrontation, directing, arguing or contempt and the importance of being supportive and affirming and reinforcing of change. The second part of the video involved producing a demonstration role-play of a buddy-MI session. This involved developing a vignette, recruiting actors, recording the session in the studio, audio-visual editing, cover art and post-production. The role-play models some of the different types of positive interactions and buddy-language that might occur during a buddy-MI session and on-screen captions are provided to highlight desirable buddy utterances as they occur. The script of the Buddy basics DVD was developed with reference to the work of Hettema's (2009) MI training videos, Manuel, Houck, and Moyer's (2011) findings in relation to significant other participation in Project MATCH (Project Match Research Group, 1993) and Apodaca and Longabaugh's (2009) review and preliminary evaluation of the mechanisms of change in motivational interviewing. Attempting to quantitatively evaluate the effectiveness of this buddy-training approach is beyond the scope of the present study however feedback from buddies following pilot interviews indicated that the materials are helpful.

The active-control intervention (treatment as usual)

Because MI has been shown to be effective across a range of health promoting behaviours, comparing the experimental buddy-MI to no-treatment would not be overly meaningful, notwithstanding the fact that most people who are sedentary are in all likelihood receiving no treatment. Therefore, the control group will receive an active MI intervention. The control group MI intervention differs from the experimental intervention only in that it involves no motivational-buddy.

Treatment delivery

Two related processes, clinical supervision and fidelity monitoring, are required to ensure that quality MI is delivered equivalently to participants in both groups. While related, these two processes are conducted separately as described below.

Therapist skill development/Clinical supervision

The therapist/PhD level researcher holds a Bachelor of Sports Coaching (BSpC) and a Masters degree in Health Sciences (MHealSc) including sports psychology and MI papers, and a three-day training workshop specific to the MITI 3.1.1 instrument (Moyers, et al., 2010). From this baseline, the therapist/researcher received supervision and feedback spanning the pilot period and ongoing into the main study.

During the pilot period, each video recording was first reviewed by the researcher and scored using the MITI 3.1.1 instrument (Moyers, et al., 2010). The MITI scores were entered into an EXCEL® spreadsheet and graphs were generated to map the following dimensions: Global MI Spirit; the Reflection: Question ratio (R:Q); the percentage of Open Questions (out of all questions) (%OC); and the percentage of Complex Reflections (out of all reflections) (%CR). In addition, the therapist/researcher carried out self-reflective analysis after selected sessions: writing a reflection (1-2 paragraphs), identifying strengths and less strong characteristics and writing a plan to improve particular aspects of practice as identified.

In addition, the therapist/researcher received fortnightly supervision, feedback and ongoing coaching from a University-based PhD level MI trainer; a Member of the Motivational Interviewing Network of Trainers (MINT). Supervision included the review of recordings, coding exercises and calibration of coding, observation and coding of MI sessions in real-time and ongoing reviews of performance, with a focus on continuous skill development. A therapist skill level of competency was achieved consistently across all of the MITI subscales and supervision is scheduled for the duration of the study.

Fidelity monitoring

Ongoing fidelity monitoring will be via the MITI 3.1.1 instrument (Moyers, et al., 2010) as per the standard recommended protocol for the review of recorded MI sessions. It is important to note that for the purpose of comparable (between-group) fidelity scoring, therapist utterances that reflect buddy utterances are not counted even if they are directed back to the client. Total therapist utterances (and behaviour counts) may be reduced depending on the level of contribution made by the buddy but the MITI behaviour count ratios hold and the global scores are evaluated using the standard criteria and method. Significant volleys may occur between the buddy and the client but these are not captured by the MITI. Both the Motivational Interviewing Skill Code (MISC) (Miller, Moyers, Ernst, & Amrhein, 2008) and the Motivational Interviewing with Significant Others (MISO) (Apodaca, et al., 2007) could be applied to analyse buddy utterances and provide additional data but this is beyond the scope of the current study.

The fidelity monitoring schedule will be based on retrospective random single blinded sampling of 25% of all interviews per quarter. The randomly selected

20 min video clips will be collated onto one DVD for review and rating by the study supervisor. Fidelity data (in particular between-group comparisons) will be analysed and fed back to the therapist during supervision and subsequently used in later data analyses. Table 1 shows the pilot-study fidelity scores based on 16 first-session interviews and similar data will be produced for the duration of the main study.

Table 1: Pilot study fidelity scores via the MITI 3.1.1 instrument, n = 16

Measure	Control group	Experimental group
Global clinician rating	4.45	4.13
Reflection to Question Ratio (R:Q)	2.2	2.1
Percent Open Questions (%OC)	76%	78%
Percent Complex Reflections (%CR)	73%	86%
Percent MI-Adherent (% MIA)	100%	100%

Outcome measures

Outcome data (Table 2) will be collected in several different ways: self-report via on-line multi-choice questionnaires, objective self-administered fitness tests, coding of video-recorded MI sessions, and via free-text exit interview responses.

Process evaluation

A process evaluation will explore the implementation of the intervention including number of sessions, treatment fidelity and participant adherence to the assessment protocol and also via exit survey information describing the participants' own experience of being part of the trial. Data from exit interviews will be analysed for emergent themes using NVIVO™ software.

Table 2: Outcome measures

Outcome measure	Instrument	Explanation	Administered
Primary Self-reported physical activity	International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003)	Long form – last 7-days recall, self-administered on-line questionnaire	Baseline, 1, 3 & 12-months
Cardiorespiratory fitness	Cooper 12-minute run test (Cooper, 1968)	Sub-maximal running/walking test to assess aerobic fitness: converted to VO2Max as per Cooper (1968)	Baseline, 1, 3 & 12-months
Health-related quality of life	SF36v2 (Quality Metric, USA)	Self-administered short-form health-related quality of life survey	Baseline, 1, 3 & 12-months
Secondary Exercise readiness (stage of change)	Exercise Stages of Change - Short Form (Marcus, et al., 1992)	One item short form exercise readiness questionnaire based on the Transtheoretical Model (Prochaska & DiClemente, 1983)	Baseline, 1, 3 & 12-months
Self-efficacy	Generalised Self-Efficacy scale (GSE) (Schwarzer et al., 1981) with additional Exercise Self-efficacy Scale (ESE) items added (Schwarzer & Renner, 2000)	Self-reported perceived self-efficacy and exercise specific self-efficacy	Baseline, 1, 3 & 12-months
Social support	Norbeck Social Support Questionnaire (NSSQ) (Norbeck, et al., 1981, 1983)	Measures multiple components of social support including functional properties, network properties, amount of support from specific sources as well descriptive data about recent losses	Baseline & 12-months
Satisfaction with the social relationship (Experimental group only)	Partner Interaction Questionnaire (PIQ-20) (Cohen & Lichtenstein, 1990)	The PIQ-20 modified to change the context from smoking cessation to physical activity	12-months
Motivational-buddy empathy/helping style (Experimental group only)	The Helpful Responses Questionnaire (HRQ) (Miller, et al., 1991)	A measure of helping-style/ empathy, a brief free-response questionnaire	Baseline
MI outcomes Treatment fidelity	Motivational Interviewing Treatment Integrity instrument (MITI 3.1.1) (Moyers, et al., 2010)	Used to code and rate randomly selected interview recordings	25 % random selection of all MI session recordings
Qualitative Participant/Buddy exit surveys	A brief six question free-response questionnaire	Analysed using thematic analysis	12-months

Statistical methods

All statistical analyses will be overseen by the UC Health Sciences statistician/advisor to ensure that appropriate and robust procedures are followed. The SPSS™ software will be used for the analysis. The intention to treat principle will be adhered to such that all randomised participants will be analysed in the groups to which they were originally assigned, regardless of their adherence and the treatment they actually receive and regardless of subsequent dropout or any other deviation from the protocol (Moher, Schulz, & Altman, 2001). If a total of 60 participants enter this two-treatment parallel-design study, the probability is 80 percent that the study will detect a treatment difference (primary outcomes) at a two-sided 0.05 significance level. Participants' baseline characteristics will be analysed, intervention dose-by-group will be calculated, and treatment fidelity data will be analysed. Statistical adjustment will be made in the case of any significant between-group differences.

Between-group changes in means across the primary outcomes will be analysed. Multivariable analysis will be applied to adjust for the possible influence of confounding variables including age, gender and ethnicity. Logistic regression analysis will be used to examine physical activity levels in relation to current recommendations. Cox proportional hazards regression will be used to model participants' progression in relation to the Cooper Institute's fitness categories (Cooper, 1968). Between-group differences in HRQOL will be investigated using analysis of covariance (ANCOVA). Differences in mean scores across the primary outcomes will be compared with previously published estimates of clinically important differences (CIDs) for the primary outcomes.

Discussion

The study, due to report its findings in 2014, aims to test the incremental effectiveness of motivational-buddy support in addition to one-on-one Motivational Interviewing in people who have expressed an interest in becoming more physically active. It uses a novel intervention design incorporating client-selected motivational-buddies in an effort to mitigate the twin problems of poor adherence and behavioural regression that are commonly associated with physical activity promotion programmes. Strengths of the study include the use of a pragmatic RCT design in a realistic setting, relatively unrestricted entry criteria and analysis of the primary outcomes in accordance with an intention to treat protocol. Together these features will help to provide information about the potential impact of the intervention when introduced into a service, as compared to the efficacy information typically provided by more controlled clinical trials.

As well as the effectiveness data, the study also aims to provide qualitative information on the implementation of the intervention (structure/design/dynamics of the buddy-MI sessions) that may be helpful in the refinement of future buddy-MI iterations. The buddy-MI intervention's therapeutic effectiveness is yet to be demonstrated but the potential

implications for the health-care system and the wider community are reduced resource utilisation and healthier lifestyles.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed to the study design and study protocol. DB is the principle investigator, MWB is the clinical supervisor and co-developer of the buddy-MI intervention and RK (senior supervisor) and AH (Co-supervisor) complete the supervision team. DB drafted this article. All authors have read and approved the final manuscript.

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